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RANK ORDER PROBABILITIES: TWO-SAMPLE NORMAL SHIFT ALTERNATIVES*

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PREFACE

This technical report consists of Chapters II, III and IV of a monograph concerning exact properties of rank order procedures under normal alternatives. The work was begun in June 1963 at the suggestion and under the guidance of Prof. I. Richard Savage. Upon Prof. Savage's departure to Florida State University, Prof. Charles Kraft joined him as co-advisor. Chapter I and Table A were completed in August 1964 after the author's departure to the Atomic Bomb Casualty Commission (ABCC), Hiroshima, Japan, and appeared as Technical Report No. 53 (January, 1965) of the Department of Statistics, University of Minnesota.

*All advisors have contributed much toward the completion of this research. To Prof. Savage I am deeply indebted for the formulation of the problem and for his continued interest, encouragement, guidance and generous assistance through comment and criticism. I am very grateful to Prof. Kraft for his suggestions and valuable contributions upon accepting co-advisorship during the final stages of preparation of Chapter I. I am also grateful to Prof. Milton Sobel for the experience I acquired, both in related problems and in computer work, while assisting him in earlier research, which has aided in the completion of the present work.

Computations were done on the University of Minnesota's CDC 1604 computer and the Atomic Bomb Casualty Commission's IBM 1440 computer. Both the Numerical Analysis Center (Minnesota) and ABCC have been extremely generous in aiding this research through use of their facilities. The research was also supported by Office of Naval Research contract Nonr - 710(31), NR 042-003 and by a grant from the Society of the Sigma Xi and RESA Research Fund.

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*The work was completed under the joint advisorship of Professors Savage, Kraft and Sobel.

GUIDE

The four Roman numeraled chapters of this monograph are each almost self contained. Chapter I with Table A appeared as Technical Report Number 53. Basic tables of probabilities, power, etc. are designated by letters and appear at the end of corresponding chapters, that is, (I, A), (II, B), (III, C), (IV, D). Auxiliary tables are designated by Arabic numerals and appear in the appropriate chapters.

The basic tables were prepared directly from machine output. For that reason certain inconsistencies in notation will appear between text and tables. To keep these inconsistencies within bounds all of the tables have used the notation of the basic tables. The most glaring of these inconsistencies is to designate sample sizes by m and n in the text and by M and N in the tables.

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Chapter II Power of Two-Sample Nonparametric Tests Against the Normal Shift Alternative

1. Summary

Tables of the exact power of four two-sample nonparametric tests for location against the normal shift alternative are described and presented for small sample sizes:

Tables B-1 and B-2 - Wilcoxon rank-sum test

Tables B-3 and B-4 - Terry-Hoeffding-Fisher-Yates c_1 test

Tables B-5 and B-6 - Mood-Brown median test

Tables B-7 and B-8 - Kolmogorov-Smirnov $D_{m,n}$ test

where odd numbered tables are for one-sided tests and even numbered tables are for two-sided tests. Selected power and efficiency comparisons are made among these four tests and with the two-sample Student's t-test. The most powerful two-sample rank test is also considered.

The power tables are derived from Table A and values are presented to 8 decimal places for all sample sizes $2 \leq n \leq m \leq 7$ which yield non-trivial results, where the sample of size m has location parameter zero and the sample of size n has location parameter D = .2 (0.2) 1, 1.5, 2, 3.

2. Introduction

Power calculations presented in this chapter are based upon the following situation. Let the random variables $X_1, \ldots, X_m$ ($Y_1, \ldots, Y_n$) be normally distributed with mean 0(D) and variance 1, all m+n random variables being mutually independent. Let $U = (U_1, \ldots, U_{m+n})$, $U_1 < \ldots < U_{m+n}$, denote the order statistics of the combined group of m+n random variables, and let $Z = (Z_1, \ldots, Z_{m+n})$ denote a random vector of zeros and ones where the $i^{\underline{th}}$ component Z_i is 0(1) if U_i is an

$X(Y)$. If $z = (z_1, \ldots, z_{m+n})$ is a fixed vector of zeros and ones, then the probability of the rank order z, $\Pr(Z = z)$ is given by

$$\Pr(Z = z) = P_{m,n}(z|D) \tag{2.1}$$

which is tabulated in Table A.

If $T(z)$ is a statistic defined for each value of z for a specified combination of sample sizes m and n, then the following procedure can be used to construct critical regions based on this statistic. Arrange all of the z's in a list so that as you proceed down the list the corresponding values of $T(z)$ will be decreasing (or, strictly speaking, non-increasing since several z's may give the same value of $T(z)$). For a one-sided test we place in the critical region ω all z such that $T(z) \geq T_0$. We will have a test with significance level

$$a = K \Big/ \binom{m+n}{n}, \tag{2.2}$$

where K is the number of z's such that $T(z) \geq T_0$, for under the null hypothesis each rank order z is equally likely. When a nominal significance level of α is desired we will use the smallest value of T_0 satisfying

$$K \Big/ \binom{m+n}{n} \leq \alpha, \tag{2.3}$$

and the resulting T_0 is the critical value of the test. By using this procedure the tests will always be conservative in the sense that the Type I error will never exceed the nominal level. However, the Type I error will be as close as possible to the desired nominal level as the discrete character of the distributions permits.

Similarly, for a two-sided test (i.e., large and small values are significant), we place in the critical region all z such that $T(z) \geq T_0'$ or $T(z) \leq T_0''$ and have a test with significance level

$$(2.4) \qquad a = K' \Big/ \binom{m+n}{n} .$$

Here K' is the number of z's such that $T(z) \geq T_0'$ plus the number of z's such that $T(z) \leq T_0''$. Suitable for symmetric distributions (and the method that we shall employ in this chapter, even in cases where the distributions are not symmetric) is the procedure that when a nominal level of α is desired we will use the smallest value of T_0' and the largest value of T_0'' such that both

$$(2.5) \qquad K' \Big/ \binom{m+n}{n} \leq \alpha$$

and

(2.6) $\quad K'/2$ is the number of z's such that $T(z) \geq T_0'$.

This implies K' is an even integer. It should be noted that Table A already has the z's arranged in decreasing order for the test statistic c_1.

The power of a test is then computed from Table A as

$$(2.7) \qquad \Pr(\omega_\alpha ; D) = \sum_{z^j \in \omega_\alpha} P_{m,n}(z^j | D)$$

where ω_α is the critical region according to (2.3) or (2.5) and (2.6). Nominal levels of α used are α = .25, .10, .05, .025, .01, .005. Power values are given for D = .2(.2) 1, 1.5, 2, 3. In Tables B-1 through B-8 values are given to 8 decimal places and are believed accurate to within one unit in the eighth place.

3. Power of the Wilcoxon two-sample rank-sum test: Tables B-1 and B-2

The Wilcoxon two-sample rank-sum test (Wilcoxon, 1945; Mann and Whitney, 1947) may be described as follows. For any rank order z the Wilcoxon statistic W is given by

$$W = W(z) = \sum_{i=1}^{m+n} i z_i , \tag{3.1}$$

the sum of the ranks of the Y-sample when all the m+n observations are ranked together. Note that $n(n+1)/2 \leq W \leq n(n+1)/2 + mn$ and thus that W may take on at most mn+1 distinct values (it is seen in Table A and can be easily shown that for the present case of sampling from two non-degenerate normal distributions all mn+1 values have non-zero probability). The null hypothesis of no difference between location parameters is rejected for large values of W, if the translation alternative being considered is $D > 0$ (one-sided test). Similarly, for a two-sided test the null hypothesis is rejected for large or small values of W.

Tables B-1 and B-2 give the power of the Wilcoxon test against the normal shift alternative for one-sided and two-sided tests, respectively. The critical region ω_α for the one-sided Wilcoxon test at the nominal level of significance α was chosen in the following manner. From Table A an integer (critical value) T_0 was found such that $\Pr(W(z) \geq T_0) \leq \alpha$ and $\Pr(W(z) \geq T_0 - 1) \not\leq \alpha$ for the nominal levels of α. The critical region ω_α consists of all z such that $W(z) \geq T_0$. Similarly, for the two-sided test, an integer T_0' was found such that $\Pr(W(z) \geq T_0') \leq \alpha/2$ and $\Pr(W(z) \geq T_0' - 1) > \alpha/2$ for the nominal levels of α. The critical region ω_α consists of all z such that $W(z) \geq T_0'$ or $\leq n(n+1)/2 + mn - T_0' = T_0''$. Power was calculated using (2.7).

Below each value of power for the Wilcoxon test, on the line labeled T, is given the power of the two-sample Student's t-test for the same α's and shift alternatives. Let $\bar{x}_m$ and $\bar{y}_n$ denote two sample means which are to be tested by the statistic

$$t = (\bar{x}_m - \bar{y}_n) \Big/ \left(\frac{(m-1)\, s_x^2 + (n-1)\, s_y^2}{m+n-2} \cdot \frac{n+m}{nm} \right)^{\frac{1}{2}}$$

using a test of size α for t, where m and n denote the sample sizes with sample variances s_x^2 and s_y^2, respectively. The power of a one-sided test based on t to detect a difference $D > 0$ between population means when the populations are normal with unit variance is given (Greenwood and Hartley, 1962) by

$$1 - \Pr(t \le t(\alpha,\gamma) | \gamma, \delta)$$

(3.3) $$= 1 - 2^{(2-\gamma)/2} \Gamma^{-1}(\gamma/2)\, z_0^{-\gamma} \int_0^\infty u^{\gamma-1} e^{-u^2/2z_0^2} F(u-\delta)du$$

where $\delta = D/(1/m + 1/n)^{1/2}$, $F(x)$ is the standard normal cumulative distribution function, $z_0 = t(\alpha,\gamma)/\sqrt{\gamma}$, $t(\alpha,\gamma)$ is the upper 100 α% point of the t-distribution with γ degrees of freedom, and $\gamma = m+n-2$. Similarly, the power of the two-sided test is given by

$$1 - \Pr(-t(\alpha,\gamma) \le t \le t(\alpha,\gamma) | \gamma, \delta)$$

(3.4) $$= 1 - \Pr(t \le t(\alpha,\gamma) | \gamma, \delta) - \Pr(t < - t(\alpha,\gamma) | \gamma, \delta)$$

$$= 2 - 2^{(2-\gamma)/2} \Gamma^{-1}(\gamma/2)\, z_0^{-\gamma} \int_0^\infty u^{\gamma-1} e^{-u^2/2z_0^2} [F(u-\delta)+F(u+\delta)]du.$$

Power of the t-test was computed using a variation of Romberg quadrature to evaluate (3.3) and (3.4). Tables B-9 and B-10 give power values to eight decimal places for one-and two-sided tests, respectively, for test sizes α = .25, .10, .05, .025, .01, .005 and for normal shift alternatives D = .2(.2) 1, 1.5, 2, 3.

Various numerical methods have been used previously to investigate the power of the Wilcoxon test. Tsao (1957) gives $P_{m,n}(z|D)$ for m = n = 2 and 3, D = .25(.25)1.50, evaluated by means of interpolating polynomials, and uses this method to evaluate efficiency (asymptotic as D $\to$ 0) for small sample sizes. Tsao's values of $P_{m,n}(z|D)$ appear to be correct to within 1 or 2 units in the second leading non-zero digit. Dixon (1954), using numerical integration, gives values of power of the two-sided test to 3 decimal places for m = n = 3, 4 and 5; D = 0(.25)2(.5)5 for selected levels of significance. Most of Dixon's values are correct as given, but several err (one by .004).

The moments of the distribution of W under the alternative hypothesis are of interest for use in the Edgeworth expansion as an approximation to the non-null distribution of W. Sundrum (1954) gives expressions for the first four moments of the Mann-Whitney statistic (a linear function of W) under alternative shift hypothesis D. These expressions involve selected rank order probabilities for sample sizes (m,n) = (1,1), (2,1), (3,1), (2,2), (4,1), and (3,2), all of which are available in Table A. Sundrum provides values for calculating the moments for $h = D/(\sigma\sqrt{2}) = 0(.1).6$, where σ^2 is the common variance of the X-and Y-populations. Table 1 gives the expected value and central moments of W for alternative hypotheses D = 0(.2)1, 1.5, 2, 3 and m = n = 1(1) 6.

TABLE 1

FIRST 4 CENTRAL MOMENTS OF THE WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D, SAMPLE SIZES M = N

D	μ_1	μ_2	μ_3	μ_4
		M = N = 1		
0.0	1.5000	0.2500	0.0000	0.0625
0.2	1.5562	0.2468	-0.0278	0.0641
0.4	1.6114	0.2376	-0.0529	0.0682
0.6	1.6643	0.2230	-0.0733	0.0738
0.8	1.7142	0.2041	-0.0874	0.0791
1.0	1.7603	0.1823	-0.0949	0.0826
1.5	1.8556	0.1236	-0.0879	0.0778
2.0	1.9214	0.0725	-0.0611	0.0567
3.0	1.9831	0.0167	-0.0161	0.0158
		M = N = 2		
0.0	5.0000	1.6667	0.0000	5.6668
0.2	5.2249	1.6433	-0.3652	5.6091
0.4	5.4454	1.5754	-0.6904	5.4342
0.6	5.6573	1.4686	-0.9431	5.1423
0.8	5.8568	1.3316	-1.1038	4.7376
1.0	6.0410	1.1749	-1.1685	4.2365
1.5	6.4223	0.7646	-0.9950	2.7660
2.0	6.6854	0.4249	-0.6175	1.4497
3.0	6.9322	0.0859	-0.1227	0.2217
		M = N = 3		
0.0	10.5000	5.2500	0.0000	65.3625
0.2	11.0061	5.1735	-1.7150	64.1945
0.4	11.5022	4.9509	-3.2322	60.8641
0.6	11.9788	4.6017	-4.3916	55.6760
0.8	12.4278	4.1552	-5.0988	49.0510
1.0	12.8423	3.6464	-5.3435	41.6771
1.5	13.7002	2.3288	-4.3888	23.4894
2.0	14.2922	1.2599	-2.5879	10.5274
3.0	14.8475	0.2365	-0.4464	1.2041

TABLE 1 (CONTINUED)

FIRST 4 CENTRAL MOMENTS OF THE WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D, SAMPLE SIZES M = N

D	μ_1	μ_2	μ_3	μ_4
		M = N = 4		
0.0	18.0000	12.0001	0.00	364.8
0.2	18.8997	11.8213	-5.21	357.1
0.4	19.7816	11.3013	-9.80	334.8
0.6	20.6290	10.4871	-13.27	301.0
0.8	21.4271	9.4474	-15.34	259.1
1.0	22.1640	8.2658	-16.00	214.4
1.5	23.6893	5.2215	-12.87	111.1
2.0	24.7416	2.7800	-7.37	45.3
3.0	25.7288	0.4972	-1.16	4.1
		M = N = 5		
0.0	27.5000	22.916	0.0	1380.0
0.2	28.9058	22.570	-12.4	1348.0
0.4	30.2838	21.564	-23.3	1254.9
0.6	31.6078	19.990	-31.5	1119.1
0.8	32.8549	17.980	-36.3	947.0
1.0	34.0063	15.701	-37.7	769.9
1.5	36.3895	9.848	-29.9	373.9
2.0	38.0338	5.188	-16.9	150.0
3.0	39.5763	0.896	-2.4	1.7
		M = N = 6		
0.0	39.0001	39.00	0.0	4105.5
0.2	41.0244	38.40	-25.1	3982.0
0.4	43.0087	36.68	-47.5	3706.0
0.6	44.9153	33.97	-64.2	3278.5
0.8	46.7111	30.53	-73.7	2756.7
1.0	48.3690	26.62	-76.3	2212.1
1.5	51.8008	16.61	-59.9	999.5
2.0	54.1686	8.68	-33.2	377.3
3.0	56.3899	1.47	-4.8	21.4

4. Power of the Terry-Hoeffding-Fisher-Yates two sample c_1 test: Tables B-3 and B-4

The two-sample c_1 test (Terry, 1952; Hoeffding, 1951) may be described as follows. For any rank order z the c_1 statistic is given by

$$c_1 = c_1(z) = \sum_{i=1}^{m+n} z_i \mathcal{E}(V_i) \tag{4.1}$$

where $V_1, \ldots, V_{m+n}$ are the order statistics of a sample of size m+n drawn from a standard normal population and the operator $\mathcal{E}$ denotes expectation. The null hypothesis of no difference between location parameters is rejected for large values of c_1, if the translation alternative being considered is $D > 0$ (one-sided test). Similarly, for a two-sided test the null hypothesis is rejected for large or small values of c_1.

Tables B-3 and B-4 give the power of the c_1 test against the normal shift alternative for one-sided and two-sided tests, respectively. The critical region ω_α for the one-sided c_1 test at the nominal significance level α was chosen as follows. From Table A the smallest number (critical value) T_0 such that $Pr(c_1(z) \geq T_0) \leq \alpha$ was found. The critical region ω_α consists of all z such that $c_1(z) \geq T_0$. Similarly, for the two-sided test, the smallest number T_0' such that $Pr(c_1(z) \geq T_0') \leq \alpha/2$ and $Pr(c_1(z) \leq -T_0') \leq \alpha/2$ was found. The critical region consists of all z such that $c_1(z) \geq T_0'$ or $\leq -T_0' = T_0''$. In both Tables B-3 and B-4 the power of the two sample Student's t-test is given for the same α's and shift alternatives.

The power of the c_1 test has been investigated by several authors. Terry (1952) gives some Monte Carlo results. Teichroew (1955) presents Monte

Carlo values of $P_{m,n}(z|D)$ for sample sizes $(m,n) = (3,2)$, $(3,3)$, $(4,2)$, and $(4,3)$; $D = 0\ (.25)\ 1.5\ (.5)\ 2.5$. His 4 and 5 decimal place values are correct to at least within one unit in the second decimal place. Klotz (1964) gives $P_{m,n}(z|D)$ for $m = n = 3$, 4 and 5; $D = .25, .5(.5)2(1)6$; and power values for $\alpha = .05714$ $(m = n = 4)$, $\alpha = .04762$ $(m = n = 5)$ for $D = .25, .5\ (.5)\ 2, 3, 4$. Comparison with Table A shows differences as large as 1 unit in the sixth decimal place but generally high accuracy. The power values for $\alpha = .04762$ seem to be correct to within one unit in the fourth decimal place.

Moments of the distribution of c_1 under the alternative hypothesis are of interest for use in the Edgeworth expansion as an approximation to the non-null distribution of c_1. The expected value and central moments of c_1 were calculated from Table A for $m = n = 1(1)\ 6$ and $D = 0\ (.2)\ 1, 1.5, 2, 3$ and are given in Table 2.

5. Power of the Mood-Brown median test; Tables B-5, B-6

The median test (Mood, 1950; Brown and Mood, 1951; Westenberg, 1948 and 1950) may be described as follows. For any rank order z the median statistic M' is given by

$$(5.1) \qquad M' = M'(z) = \sum_{i=\left[\frac{m+n}{2}\right]+1}^{m+n} z_i$$

where $[x]$ is the smallest integer $\geq x$.

TABLE 2

FIRST 4 CENTRAL MOMENTS OF THE C_1 STATISTIC
UNDER NORMAL SHIFT ALTERNATIVE D, SAMPLE SIZES M = N

D	μ_1	μ_2	μ_3	μ_4
		M = N = 1		
0.0	0.0000	0.3183	0.0000	0.1013
0.2	0.0635	0.3143	-0.0399	0.1038
0.4	0.1256	0.3025	-0.0760	0.1106
0.6	0.1854	0.2839	-0.1053	0.1197
0.8	0.2417	0.2599	-0.1256	0.1283
1.0	0.2937	0.2321	-0.1363	0.1339
1.5	0.4012	0.1573	-0.1262	0.1261
2.0	0.4754	0.0923	-0.0877	0.0919
3.0	0.5451	0.0212	-0.0231	0.0257
		M = N = 2		
0.0	0.0000	0.7652	0.0000	1.1276
0.2	0.1525	0.7538	-0.1233	1.1191
0.4	0.3018	0.7205	-0.2320	1.0924
0.6	0.4449	0.6684	-0.3147	1.0442
0.8	0.5793	0.6021	-0.3647	0.9721
1.0	0.7027	0.5269	-0.3813	0.8767
1.5	0.9558	0.3341	-0.3121	0.5756
2.0	1.1275	0.1799	-0.1847	0.2959
3.0	1.2847	0.0341	-0.0331	0.0415
		M = N = 3		
0.0	0.0000	1.2350	0.0000	3.4339
0.2	0.2461	1.2148	-0.2232	3.3778
0.4	0.4868	1.1564	-0.4169	3.2127
0.6	0.7171	1.0657	-0.5584	2.9493
0.8	0.9328	0.9512	-0.6363	2.6072
1.0	1.1303	0.8229	-0.6514	2.2142
1.5	1.5326	0.5028	-0.4977	1.2247
2.0	1.8026	0.2586	-0.2701	0.5233
3.0	2.0465	0.0441	-0.0396	0.0508

TABLE 2 (CONTINUED)

FIRST 4 CENTRAL MOMENTS OF THE C_1 STATISTIC
UNDER NORMAL SHIFT ALTERNATIVE D, SAMPLE SIZES M = N

D	μ_1	μ_2	μ_3	μ_4
		M = N = 4		
0.0	0.0000	1.7141	0.0000	7.1138
0.2	0.3415	1.6846	-0.3319	6.9624
0.4	0.6754	1.5992	-0.6168	6.5254
0.6	0.9944	1.4670	-0.8191	5.8515
0.8	1.2925	1.3014	-0.9225	5.0151
1.0	1.5649	1.1174	-0.9308	4.1050
1.5	2.1171	0.6666	-0.6794	2.0347
2.0	2.4851	0.3332	-0.3490	0.7699
3.0	2.8151	0.0532	-0.0452	0.0587
		M = N = 5		
0.0	0.0000	2.1984	0.0000	12.2080
0.2	0.4380	2.1590	-0.4464	11.9080
0.4	0.8659	2.0453	-0.8261	11.0499
0.6	1.2743	1.8700	-1.0899	9.7513
0.8	1.6554	1.6515	-1.2166	8.1813
1.0	2.0031	1.4103	-1.2144	6.5264
1.5	2.7054	0.8275	-0.8577	2.9927
2.0	3.1710	0.4057	-0.4242	1.0377
3.0	3.5866	0.0621	-0.0505	0.0661
		M = N = 6		
0.0	0.0000	2.6859	0.0000	18.7392
0.2	0.5350	2.6363	-0.5649	18.2332
0.4	1.0575	2.4934	-1.0420	16.7955
0.6	1.5559	2.2738	-1.3673	14.6468
0.8	2.0203	2.0012	-1.5156	12.0955
1.0	2.4434	1.7019	-1.5001	9.4653
1.5	3.2957	0.9864	-1.0332	4.0943
2.0	3.8587	0.4770	-0.4971	1.3284
3.0	4.3595	0.0708	-0.0560	0.0758

The statistic M'' is given by

$$(5.2) \qquad M'' = M''(z) = \max\left(M'(z), M'(z^t)\right),$$

where z^t is defined to be the vector whose ith component is $z_i^t = z_{m+n+1-i}$. In the one-sided case, the null hypothesis of no difference between medians is rejected for large values of M', if the translation alternative being considered is $D > 0$. In the two-sided case, the null hypothesis is rejected for large values of M''. Note that $0 \leq M' \leq n$ and $[n/2] + 1 \leq M'' \leq n$.

Tables B-5 and B-6 give the power of the Mood-Brown test against the normal shift alternative for one-sided and two-sided tests, respectively. Power has been calculated using (2.7) for all sizes of test α attainable without randomization and such that $\alpha < .5$. For Table B-5 the rejection region ω_α contains all z such that $M'(z) \geq M'_\alpha$, where $\Pr(M'(z) \geq M'_\alpha) = \alpha$. For table B-6 the rejection region contains all z such that $M''(z) \geq M''_\alpha$, where $\Pr(M''(z) \geq M''_\alpha) = \alpha$. In both tables the power of the two-sample Student's t-test is given for the same α's and shift alternatives.

Dixon (1954) gives values of the power of the two-sided test to 3 decimal places for $m = n = 3, 4, 5$; $D = 0\ (.25)\ 2\ (.5)\ 5$ for selected levels of significance. Most of Dixon's values are correct as given, with errors of at most one in the third decimal place.

6. Power of the Kolmogorov-Smirnov two-sample test: Tables B-7 and B-8

The Kolmogorov-Smirnov two-sample test (Smirnov, 1939 and 1948; Kolmogorov, 1941; Massey, 1951) may be described as follows. (Although this test is often

referred to as the $D_{m,n}$ test, to avoid confusion with the notation for the shift alternative the lower case d is used here.) For any rank order z the statistic d^+ is given by

$$(6.1) \qquad d^+ = d^+(z) = \max_{j=1,\ldots,m+n} \left(\sum_{i=1}^{j} [n(1-z_i) - mz_i] \right)$$

and the statistic d is given by

$$(6.2) \qquad d = d(z) = \max_{j=1,\ldots,m+n} \left| \sum_{i=1}^{j} [n(1-z_i) - mz_i] \right| .$$

In the one-sided case, the null hypothesis of no difference between location parameters is rejected for large positive values of d^+, if the translation alternative being considered is $D > 0$. In the two-sided case, the null hypothesis of no difference between distributions is rejected for large values of d.

Tables B-7 and B-8 give the power of the Kolmogorov-Smirnov test against the normal shift alternative for one-sided and two-sided tests, respectively. Power has been calculated using (2.7) for all sizes of test α attainable without randomization and such that $\alpha \leq .25$. For Table B-7 the rejection region ω_α contains all z such that $d^+(z) \geq d^+_\alpha$, where $Pr(d^+(z) \geq d^+_\alpha) = \alpha$. Similarly, for Table B-8 the rejection region contains all z such that $d(z) \geq d_\alpha$, where $Pr(d(z) \geq d_\alpha) = \alpha$. In both tables the power of the two-sample Student's t-test is given for the same α's and shift alternatives.

7. Most powerful two-sample test based on ranks

If, for a given D, the z-values are arranged in order of decreasing values of $P_{m,n}(z|D)$, then it is easy to specify the critical region of size $\alpha = K/\binom{m+n}{n}$ for the most powerful two-sample rank test (MPRT) for the normal shift alternative. The critical region consists of the z-values corresponding to the K largest values of $P_{m,n}(z|D)$, where $1 \leq K \leq \binom{m+n}{n}$. It is seen by inspection of Table A that the critical region for this test depends upon the value of D, the alternative hypothesis.

One reason for considering this test is that it enables one to achieve the largest number of useful test sizes without resorting to randomization. A second reason for considering this test is the interest in theoretical statistics concerning the relationships among the power of the MPRT, the Wilcoxon test and the c_1 test. Various questions have been raised, such as:

i) Is the c_1 test as powerful or more powerful than the Wilcoxon test for all m,n and D? (see, for example, Dwass (1956)).

ii) Is the MPRT identical to either the c_1 or Wilcoxon tests?

The answer to both these questions is no, as is pointed out in the following.

Inspection of Table A revealed 29 cases for which the (non-randomized) test size α is less than .10 and the MPRT is more powerful than both the Wilcoxon and c_1 tests. In 15 cases the Wilcoxon test is more powerful than the c_1 test; in 6 of these cases the MPRT is more powerful than the Wilcoxon test. In 14 cases the c_1 test is more powerful than the Wilcoxon test; in 3 of these cases the MPRT is more powerful than the c_1 test. When randomization is permitted, similar results can occur (see for example, Table 4: $m = n = 6, 7$ and $\alpha = .01$). It is felt that these are all such cases in Table A except for a few that may

Table 3

Power relationship among MPRT, Wilcoxon and c_1 tests

Sample size (m, n)	Shift alternative, D	α	ω_α for Wilcoxon test	Power relationship	Power values
7, 7	.4-3.0	30/3432 = .0087	$W \geq 71$	MPRT = W > c_1	MPRT = W : .990085* c_1 : .988419* * for D = 3.0
7, 7	3.0	65/3432 = .0189	$W \geq 69$	MPRT > W > c_1	MPRT : .997366 W : .997347 c_1 : .996786
7, 6	.2-3.0	19/1716 = .0111	$W \geq 58$	MPRT = W > c_1	Not computed
7, 6	.2-1.5	44/1716 = .0256	$W \geq 56$	MPRT = c_1 > W	"
7, 6	2.0,3.0	44/1716 = .0256	$W \geq 56$	MPRT > W > c_1	"
6, 6	2.0,3,0	30/924 = .0325	$W \geq 51$	MPRT = W > c_1	MPRT = W : .885109** c_1 : .884105** ** for D = 2.0
7, 5	3.0	19/792 = .0240	$W \geq 45$	MPRT > W > c_1	MPRT : .991364 W : .991255 c_1 : .991089
7, 5	.2-1.0	29/792 = .0366	$W \geq 44$	MPRT > c_1 > W	MPRT : .068973*** c_1 : .068965*** W : .068875*** *** for D = 0.2
7, 5	1.5-3.0	29/792 = .0366	$W \geq 44$	MPRT > W > c_1	Not computed
7, 5	.2-1.5	59/792 = .0745	$W \geq 42$	MPRT = c_1 > W	"
7, 5	2.0,3,0	59/792 = .0745	$W \geq 42$	MPRT > c_1 > W	"

Note: Power values are given to show the magnitudes involved. The values were calculated by hand, and those reported as "not computed" were not done to sufficient accuracy to report here.

Table 3 (Continued)

Power relationship among MPRT, Wilcoxon and c_1 tests

Sample size (m,n)	Shift alternative, D	α	ω_α for Wilcoxon test	Power relationship	Power values
6, 5	.2-2.0	19/462 = .0411	$W \geq 40$	MPRT = c_1 > W	Not computed
6, 5	3.0	19/462 = .0411	$W \geq 40$	MPRT = W > c_1	"
6, 5	.2-1.5	29/462 = .0628	$W \geq 39$	MPRT = c_1 > W	"
6, 5	2.0,3,0	29/462 = .0628	$W \geq 39$	MPRT = W > c_1	"
6, 5	.2-1.5	41/462 = .0887	$W \geq 38$	MPRT = c_1 > W	"
6, 5	2.0	41/462 = .0887	$W \geq 38$	MPRT > c_1 > W	"
6, 5	3.0	41/462 = .0887	$W \geq 38$	MPRT > W > c_1	"
7, 4	.2-3.0	18/330 = .0545	$W \geq 33$	MPRT = c_1 > W	"
7, 4	.2-3.0	27/330 = .0818	$W \geq 32$	MPRT = c_1 > W	"
5, 5	1.5-3.0	19/252 = .0754	$W \geq 35$	MPRT = W > c_1	"
6, 4	1.5	12/210 = .0571	$W \geq 30$	MPRT > W > c_1	"
6, 4	2.0,3.0	12/210 = .0571	$W \geq 30$	MPRT = W > c_1	"
6, 4	.2-3.0	18/210 = .0857	$W \geq 29$	MPRT = c_1 > W	"
7, 3	.2-3.0	7/120 = .0583	$W \geq 24$	MPRT = c_1 > W	"
7, 3	.2-3.0	11/120 = .0917	$W \geq 23$	MPRT = c_1 > W	"
5, 4	.8-3.0	12/126 = .0952	$W \geq 26$	MPRT = W > c_1	"
6, 3	.2-2.0	7/84 = .0833	$W \geq 21$	MPRT = c_1 > W	"
6, 3	3.0	7/84 = .0833	$W \geq 21$	MPRT = W > c_1	"

have been overlooked for sample sizes $(m, n) = (6, 6), (7, 6)$, and $(7, 7)$ when α is close to .10. It is interesting to note that in one case ($m = 7$, $n = 6$, $\alpha = 19/1716$) the Wilcoxon test is more powerful than the locally most powerful rank order test, c_1, for the relatively small value $D = .2$. These observations are summarized in Table 3.

8. Selected power comparisons

Power comparisons of several kinds which are of interest may be made using Table A. Comparisons are specified by fixing all but one of the following factors and varying that one factor for the comparison:

i) type of test (*t*, Wilcoxon, c_1, median, Kolmogorov-Smirnov)

ii) sample sizes

iii) size of test (Type 1 error)

iv) one-sided or two-sided test

v) alternative hypothesis(D)

Perhaps of most interest are selected comparisons of the kind where ii) - v) are fixed and i) is the factor to be varied. Table 4 compares the power of the five tests for sample sizes $m = n = 5, 6, 7$ and $m = 7$, $n = 5, 6$; size of test $\alpha = .01, .05$ (achieved by linear randomization in Table A); one-sided tests; alternative hypotheses $D = .2\ (.2)\ 1, 1.5, 2, 3$. An immediate observation from these comparisons is the fact that the c_1 and Wilcoxon tests have essentially the same power functions for these sample sizes, and further that the *t*-test shows an often negligible advantage in power over the c_1 and Wilcoxon tests.

Table 5, a rearrangement of Table 4, presents comparisons where factor ii), sample size, is varied. In Table 6 comparisons are made where factor

TABLE 4

COMPARISON OF POWER OF TWO-SAMPLE TESTS (ONE-SIDED)

	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
$M = 5,\ N = 5,\ \alpha = 0.01$								
T	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
C_1	0.019451	0.035430	0.060585	0.097515	0.148161	0.334549	0.568186	0.905400
Wilcoxon	0.019451	0.035430	0.060585	0.097515	0.148161	0.334549	0.568186	0.905400
Kolm-Smirn	0.018186	0.031279	0.051015	0.079107	0.116956	0.257104	0.447080	0.803946
Median	0.017158	0.028278	0.044837	0.068465	0.100747	0.225883	0.408371	0.781944
$M = 5,\ N = 5,\ \alpha = 0.05$								
T	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
C_1	0.086712	0.140313	0.212492	0.302224	0.405316	0.673585	0.870504	0.992794
Wilcoxon	0.086613	0.140046	0.211997	0.301471	0.404324	0.672395	0.869734	0.992740
Kolm-Smirn	0.082306	0.128125	0.188976	0.264698	0.353035	0.597811	0.806519	0.981022
Median	0.077591	0.114247	0.160195	0.214768	0.276485	0.448204	0.618812	0.872697
$M = 6,\ N = 6,\ \alpha = 0.01$								
T	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
C_1	0.021201	0.041394	0.074652	0.124771	0.193997	0.438808	0.704358	0.967803
Wilcoxon	0.021180	0.041325	0.074497	0.124499	0.193600	0.438418	0.704767	0.968874
Kolm-Smirn	0.020094	0.037505	0.065212	0.105975	0.161541	0.359811	0.592286	0.898963
Median	0.018189	0.031076	0.050094	0.076553	0.111455	0.237837	0.411451	0.770401
$M = 6,\ N = 6,\ \alpha = 0.05$								
T	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
C_1	0.091893	0.155152	0.241616	0.348695	0.468971	0.755979	0.927108	0.998349
Wilcoxon	0.091605	0.153951	0.239608	0.345843	0.465607	0.752500	0.925419	0.998300
Kolm-Smirn	0.086093	0.138243	0.207750	0.293380	0.391119	0.645811	0.840851	0.985292
Median	0.083807	0.132579	0.198098	0.280010	0.375315	0.633004	0.838271	0.987563

TABLE 4 (Continued)

COMPARISON OF POWER OF TWO-SAMPLE TESTS (ONE-SIDED)

	D =.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
$M = 7,\ N = 7,\ \alpha = 0.01$								
T	0.023203	0.048671	0.092592	0.160375	0.254070	0.564531	0.836812	0.995400
C_1	0.022986	0.047321	0.089051	0.152967	0.241011	0.535269	0.805793	0.990138
Wilcoxon	0.022801	0.047134	0.088646	0.152294	0.240128	0.535000	0.807526	0.991453
Kolm-Smirn	0.020808	0.039954	0.071048	0.117447	0.181230	0.408721	0.666931	0.956515
Median	0.020575	0.038988	0.068296	0.111067	0.168485	0.365057	0.582377	0.871569
$M = 7,\ N = 7,\ \alpha = 0.05$								
T	0.098292	0.174075	0.279150	0.407919	0.547450	0.840864	0.969582	0.999854
C_1	0.096909	0.169828	0.270484	0.393980	0.528795	0.821065	0.960526	0.999652
Wilcoxon	0.096541	0.168787	0.268527	0.391084	0.525236	0.818054	0.959479	0.999646
Kolm-Smirn	0.089200	0.147312	0.226064	0.323762	0.434871	0.713343	0.900265	0.996589
Median	0.083271	0.130294	0.192402	0.269277	0.358617	0.605501	0.814960	0.983917
$M = 7,\ N = 6,\ \alpha = 0.01$								
T	0.022323	0.045462	0.084711	0.144908	0.228461	0.515365	0.792557	0.990688
C_1	0.022006	0.044243	0.081553	0.138317	0.216759	0.487511	0.759330	0.982500
Wilcoxon	0.021969	0.044123	0.081268	0.137780	0.215906	0.486111	0.758507	0.982911
Kolm-Smirn	0.020694	0.039655	0.070550	0.116883	0.180934	0.411295	0.673236	0.959926
Median	0.019186	0.034232	0.057035	0.089155	0.131420	0.278137	0.460714	0.794704
$M = 7,\ N = 6,\ \alpha = 0.05$								
T	0.095613	0.166161	0.263590	0.383781	0.516275	0.810595	0.957015	0.999643
C_1	0.094251	0.161994	0.255031	0.369774	0.496999	0.787583	0.944323	0.999131
Wilcoxon	0.094004	0.161336	0.253863	0.368148	0.497769	0.786447	0.944320	0.999198
Kolm-Smirn	0.089492	0.148319	0.228354	0.327874	0.441059	0.722669	0.907000	0.997124
Median	0.082232	0.128176	0.189652	0.266795	0.357466	0.609933	0.821479	0.985339

TABLE 4 (Continued)

COMPARISON OF POWER OF TWO-SAMPLE TESTS (ONE-SIDED)

	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
$M = 7,\ N = 5,\ \alpha = 0.01$								
T	0.021311	0.041865	0.075998	0.127853	0.199980	0.456697	0.731756	0.980055
C_1	0.020975	0.040620	0.072833	0.121296	0.188296	0.427249	0.692024	0.965204
Wilcoxon	0.020957	0.040553	0.072671	0.120976	0.187750	0.426010	0.690489	0.964678
Kolm-Smirn	0.019103	0.037119	0.064422	0.104706	0.159909	0.359892	0.600334	0.919765
Median	0.019096	0.034423	0.058583	0.094204	0.143340	0.326279	0.558809	0.900355
$M = 7,\ N = 5,\ \alpha = 0.05$								
T	0.092455	0.156936	0.245447	0.355296	0.478609	0.769775	0.936660	0.999027
C_1	0.091187	0.153114	0.237615	0.342359	0.460421	0.745654	0.920757	0.997878
Wilcoxon	0.090865	0.152211	0.235892	0.339703	0.456934	0.741783	0.918695	0.997845
Kolm-Smirn	0.086007	0.138981	0.210221	0.298725	0.400431	0.666165	0.864097	0.991826
Median	0.079562	0.119622	0.170708	0.232317	0.302936	0.502291	0.696383	0.935436

TABLE 5

EFFECT OF CHANGE IN SAMPLE SIZE ON POWER OF TWO-SAMPLE TESTS (1-SIDED)

M	N	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
M	N	α = 0.01		T TEST					
5	5	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
7	5	0.021311	0.041865	0.075998	0.127853	0.199980	0.456697	0.731756	0.980055
6	6	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
7	6	0.022323	0.045462	0.084711	0.144908	0.228461	0.515365	0.792557	0.990688
7	7	0.023203	0.048671	0.092592	0.160375	0.254070	0.564531	0.836812	0.995400
M	N	α = 0.05		T TEST					
5	5	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
7	5	0.092455	0.156936	0.245447	0.355296	0.478609	0.769775	0.936660	0.999027
6	6	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
7	6	0.095613	0.166161	0.263590	0.383781	0.516275	0.810595	0.957015	0.999643
7	7	0.098292	0.174075	0.279150	0.407919	0.547450	0.840864	0.969582	0.999854
M	N	α = 0.01		C1 TEST					
5	5	0.019451	0.035430	0.060585	0.097515	0.148161	0.334549	0.568186	0.905400
7	5	0.020975	0.040620	0.072833	0.121296	0.188296	0.427249	0.692024	0.965204
6	6	0.021201	0.041394	0.074652	0.124771	0.193997	0.438808	0.704358	0.967803
7	6	0.022004	0.044243	0.081553	0.138317	0.216759	0.487511	0.759330	0.982500
7	7	0.022986	0.047321	0.089051	0.152967	0.241011	0.535269	0.805793	0.990138
M	N	α = 0.05		C1 TEST					
5	5	0.086712	0.140313	0.212492	0.302224	0.405316	0.673585	0.870504	0.992794
7	5	0.091187	0.153114	0.237615	0.342359	0.460421	0.745654	0.920757	0.997878
6	6	0.091893	0.155152	0.241616	0.348695	0.468971	0.755979	0.927108	0.998349
7	6	0.094251	0.161994	0.255031	0.369774	0.496999	0.787583	0.944323	0.999131
7	7	0.096909	0.169828	0.270484	0.393980	0.528795	0.821065	0.960526	0.999652

TABLE 5 (Continued)

EFFECT OF CHANGE IN SAMPLE SIZE ON POWER OF TWO-SAMPLE TESTS (1-SIDED)

$\alpha = 0.01$ WILCOXON TEST

M	N	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
5	5	0.019451	0.035430	0.060585	0.097515	0.148161	0.334549	0.568186	0.905400
7	5	0.020957	0.040554	0.072671	0.120976	0.187750	0.426010	0.690489	0.964678
6	6	0.021180	0.041325	0.074497	0.124499	0.193600	0.438418	0.704767	0.968874
7	6	0.021970	0.044123	0.081268	0.137780	0.215906	0.486111	0.758507	0.982910
7	7	0.022801	0.047134	0.088646	0.152294	0.240128	0.535000	0.807526	0.991453

$\alpha = 0.05$ WILCOXON TEST

M	N	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
5	5	0.086613	0.140046	0.211997	0.301471	0.404324	0.672395	0.869734	0.992740
7	5	0.090865	0.152211	0.235892	0.339703	0.456935	0.741782	0.918695	0.997845
6	6	0.091605	0.153951	0.239608	0.345843	0.465607	0.752500	0.925419	0.998300
7	6	0.094004	0.161336	0.253863	0.368148	0.497769	0.786447	0.944320	0.999198
7	7	0.096541	0.168787	0.268527	0.391084	0.525236	0.818054	0.959479	0.999646

$\alpha = 0.01$ KOLM-SMIRN TEST

M	N	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
5	5	0.018186	0.031279	0.051015	0.079107	0.116956	0.257104	0.447080	0.803946
7	5	0.019103	0.037119	0.064422	0.104706	0.159909	0.359892	0.600334	0.919765
6	6	0.020094	0.037505	0.065212	0.105975	0.161541	0.359811	0.592286	0.898963
7	6	0.020694	0.039655	0.070550	0.116883	0.180934	0.411295	0.673236	0.959926
7	7	0.020808	0.039954	0.071048	0.117447	0.181230	0.408721	0.666931	0.956515

$\alpha = 0.05$ KOLM-SMIRN TEST

M	N	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
5	5	0.082306	0.128125	0.188976	0.264698	0.353035	0.597811	0.806519	0.981022
7	5	0.086007	0.138981	0.210221	0.298725	0.400431	0.666165	0.864097	0.991826
6	6	0.086093	0.138243	0.207750	0.293380	0.391119	0.645811	0.840851	0.985292
7	6	0.089492	0.148319	0.228354	0.327874	0.441059	0.722669	0.907000	0.997124
7	7	0.089200	0.147312	0.226064	0.323762	0.434871	0.713343	0.900265	0.996589

TABLE 5 (Continued)

EFFECT OF CHANGE IN SAMPLE SIZE ON POWER OF TWO-SAMPLE TESTS (1-SIDED)

M	N	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
M	N	α = 0.01		MEDIAN TEST					
5	5	0.017158	0.028278	0.044837	0.068465	0.100747	0.225883	0.408371	0.781944
7	5	0.019096	0.034423	0.058583	0.094204	0.143340	0.326279	0.558809	0.900355
6	6	0.018189	0.031076	0.050094	0.076553	0.111455	0.237837	0.411451	0.770401
7	6	0.019186	0.034232	0.057035	0.089155	0.131420	0.278137	0.460714	0.794704
7	7	0.020575	0.038988	0.068296	0.111067	0.168485	0.365057	0.582377	0.871569
M	N	α = 0.05		MEDIAN TEST					
5	5	0.077591	0.114247	0.160195	0.214768	0.276485	0.448204	0.618812	0.872697
7	5	0.079562	0.119622	0.170708	0.232317	0.302936	0.502291	0.696383	0.935436
6	6	0.083807	0.132579	0.198098	0.280010	0.375315	0.633004	0.838271	0.987563
7	6	0.082232	0.128176	0.189652	0.266795	0.357466	0.609933	0.821479	0.985339
7	7	0.083271	0.130294	0.192402	0.269277	0.358617	0.605501	0.814960	0.983917

TABLE 6

COMPARISON OF POWER OF 1-AND 2-SIDED TWO-SAMPLE TESTS

TEST	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
				M = 7, N = 5, α = 0.01				
T 1-SIDED	0.021311	0.041865	0.075998	0.127853	0.199980	0.456697	0.731756	0.980055
T 2-SIDED	0.013217	0.023758	0.044101	0.077718	0.128056	0.334452	0.607505	0.950786
C1 1-SIDED	0.020975	0.040620	0.072833	0.121296	0.188296	0.427249	0.692024	0.965204
C1 2-SIDED	0.013066	0.023047	0.042109	0.073267	0.119507	0.308041	0.562542	0.921596
W 1-SIDED	0.020957	0.040554	0.072671	0.120976	0.187750	0.426010	0.690489	0.964678
W 2-SIDED	0.013066	0.023046	0.042106	0.073261	0.119496	0.308000	0.562461	0.921512
KS 1-SIDED	0.019103	0.037119	0.064422	0.104706	0.159909	0.359892	0.600334	0.919765
KS 2-SIDED	0.012579	0.020827	0.036167	0.060583	0.096102	0.240080	0.446268	0.822299
M 1-SIDED	0.019096	0.034423	0.058583	0.094204	0.143340	0.326279	0.558809	0.900355
M 2-SIDED	0.012464	0.020273	0.034555	0.056785	0.088028	0.208306	0.363311	0.592831
TEST				M = 7, N = 7, α = 0.01				
T 1-SIDED	0.023203	0.048671	0.092592	0.160375	0.254070	0.564531	0.836812	0.995400
T 2-SIDED	0.014097	0.027821	0.055089	0.101080	0.170187	0.439317	0.739367	0.986475
C1 1-SIDED	0.022986	0.047321	0.089051	0.152967	0.241011	0.535269	0.805793	0.990138
C1 2-SIDED	0.013937	0.027037	0.052816	0.095899	0.160228	0.411049	0.700255	0.974308
W 1-SIDED	0.022801	0.047134	0.088646	0.152294	0.240128	0.535000	0.807526	0.991453
W 2-SIDED	0.013927	0.026995	0.052709	0.095699	0.159929	0.410892	0.701223	0.975789
KS 1-SIDED	0.020808	0.039954	0.071048	0.117447	0.181230	0.408721	0.666931	0.956515
KS 2-SIDED	0.013303	0.024125	0.044981	0.079329	0.130474	0.337194	0.605722	0.944788
M 1-SIDED	0.020575	0.038988	0.068296	0.111067	0.168485	0.365057	0.582377	0.871569
M 2-SIDED	0.012605	0.020848	0.035867	0.059131	0.091937	0.218066	0.393780	0.755157

iv) is varied. Power of one-and two-sided tests is compared for $m = n = 7$ and $m = 7$, $n = 5$ for $\alpha = .01$.

9. Selected efficiency comparisons

The concept most frequently used in power-efficiency comparisons in large-sample theory is that of asymptotic relative efficiency (ARE) (Pitman, 1948; Noether, 1955). For small-sample theory Hodges and Lehmann (1956) have proposed a definition of efficiency that may be used in rough comparison with ARE. The Hodges-Lehmann (H-L) efficiency of test a relative to test b for alternative hypothesis D and test size α is defined to be

$$e_{a,b} = e_{a,b}(D, \alpha) = N_b^*/N_a \tag{8.1}$$

where N_a is the sample size for test a and N_b^* is the randomized sample size for test b needed to match the power of test a for the given α and D (randomization is done by linear interpolation in the sample size for test b by using the power). The definition could equally well be given in terms of randomization on the sample size of test a.

Tables 7 through 10 present the efficiency of the one-sided Wilcoxon, c_1, median and Kolmogorov-Smirnov tests, respectively, relative to the t-test. Sample sizes with $m = n$ are used for these tables, and with this restriction sample size in the definition of $e_{a,b}$ for the two-sample case may be either $m(=n)$ or $m+n = 2m$. Comparisons are made for sample sizes $m = n = 5, 6, 7$, test sizes $\alpha = .01, .05$ and alternative hypotheses $D = .2\ (.2)\ 1, 1.5, 2, 3$. The power of the t-test required to bracket the power of each of the other tests is given, with the Hodges-Lehmann efficiency immediately below.

Example: $m = n = 5$, $\alpha = .05$, $D = 0.2$

$$e_{\text{Wilcoxon}, t} \doteq .960 = [4(1-p) + 5p] / 5$$

where $p = (.086613 - .081918)/(.087800 - .081918) \doteq .798$.

Table 11 presents the efficiency of the one-sided Wilcoxon test when there is no restriction to equal sample sizes. In this case sample size in the definition of $e_{a,b}$ is m+n. Two examples of unequal sample size are given: i) Wilcoxon test sample size m = n = 7 and randomization between t-test sample sizes m = n = 7 and m = 7, n = 6; ii) Wilcoxon test sample size m = 7, n = 6 and randomization between t-test sample sizes m = 7, n = 6 and m = n = 6.

The H-L efficiencies for the Wilcoxon and c_1 tests are seen to be essentially independent of m, α and D for those values used in Tables 7 and 8. The efficiencies for the two tests differ occasionally by as much as 1 in the second decimal place but usually by an amount less than that. The efficiency of the c_1 test is generally (but not always) greater than that of the Wilcoxon test. The Wilcoxon test H-L efficiency is seen to be very close to and occasionally greater than the asymptotic relative efficiency of $3/\pi = .9580$ as given by Pitman (1949) and van der Vaart (1950). However, the H-L efficiency of the c_1 test is not as close to (differs by more than .03 from) the ARE of 1 given by Chernoff and Savage (1958). Witting (1960) gives another definition of efficiency for small parameter values and gives an efficiency for the Wilcoxon test (m = n = 5) of .9563.

The H-L efficiencies for the median and Kolmogorov-Smirnov tests are also seen to be essentially independent of m, α and D for the values given in Tables 9 and 10, except that the efficiency of the Kolmogorov-Smirnov test is seen to decrease as D increases for α and m as in Table 10. The efficiency of the Kolmogorov-Smirnov test is generally (but not always) greater than that of the median test. The median test H-L efficiency is seen to take values straddling the ARE of $2/\pi = .6366$ given by Mood (1954).

TABLE 7

HODGES-LEHMANN EFFICIENCY OF THE WILCOXON TEST

TEST	M	α	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
W	5	.01	0.019451	0.035430	0.060585	0.097515	0.148161	0.334549	0.568186	0.905400
T	4	.01	0.017923	0.030556	0.049637	0.076968	0.114140	0.254781	0.450658	0.821336
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
	$e_{w,t}$		0.9645	0.9612	0.9580	0.9549	0.9520	0.9458	0.9415	0.9404
W	6	.01	0.021180	0.041325	0.074497	0.124499	0.193600	0.438418	0.704767	0.968874
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
T	6	.01	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
	$e_{w,t}$		0.9667	0.9640	0.9613	0.9588	0.9564	0.9513	0.9476	0.9443
W	7	.01	0.022801	0.047134	0.088646	0.152294	0.240128	0.535000	0.807526	0.991453
T	6	.01	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
T	7	.01	0.023203	0.048671	0.092592	0.160375	0.254070	0.564531	0.836812	0.995400
	$e_{w,t}$		0.9657	0.9637	0.9618	0.9602	0.9587	0.9558	0.9544	0.9552
W	5	.05	0.086613	0.140046	0.211997	0.301471	0.404324	0.672395	0.869734	0.992740
T	4	.05	0.081918	0.127045	0.186890	0.261375	0.348431	0.591364	0.801534	0.980600
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
	$e_{w,t}$		0.9597	0.9576	0.9559	0.9543	0.9531	0.9513	0.9515	0.9573
W	6	.05	0.091605	0.153951	0.239608	0.345843	0.465607	0.752500	0.925419	0.998300
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
T	6	.05	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
	$e_{w,t}$		0.9506	0.9447	0.9449	0.9446	0.9446	0.9440	0.9451	0.9516
W	7	.05	0.096541	0.168787	0.268527	0.391084	0.525236	0.818054	0.959479	0.999646
T	6	.05	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
T	7	.05	0.098292	0.174075	0.279150	0.407919	0.547450	0.840864	0.969582	0.999854
	$e_{w,t}$		0.9508	0.9495	0.9484	0.9476	0.9470	0.9466	0.9476	0.9528

TABLE 8

HODGES-LEHMANN EFFICIENCY OF THE C_1 TEST

TEST	M	α	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
C1	5	.01	0.019451	0.035430	0.060585	0.097515	0.148161	0.334549	0.568186	0.905400
T	4	.01	0.017923	0.030556	0.049637	0.076968	0.114140	0.254781	0.450658	0.821336
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
	$e_{c_1,t}$		0.9645	0.9612	0.9580	0.9549	0.9520	0.9458	0.9415	0.9404
C1	6	.01	0.021201	0.041394	0.074652	0.124771	0.193997	0.438808	0.704358	0.967803
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
T	6	.01	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
	$e_{c_1,t}$		0.9687	0.9659	0.9632	0.9604	0.9578	0.9519	0.9471	0.9400
C1	7	.01	0.022986	0.047321	0.089051	0.152967	0.241011	0.535269	0.805793	0.990138
T	6	.01	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
T	7	.01	0.023203	0.048671	0.092592	0.160375	0.254070	0.564531	0.836812	0.995400
	$e_{c_1,t}$		0.9815	0.9681	0.9658	0.9635	0.9613	0.9562	0.9517	0.9403
C1	5	.05	0.086712	0.140313	0.212492	0.302224	0.405316	0.673585	0.870504	0.992794
T	4	.05	0.081918	0.127045	0.186890	0.261375	0.348431	0.591364	0.801534	0.980600
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
	$e_{c_1,t}$		0.9630	0.9609	0.9589	0.9572	0.9558	0.9535	0.9532	0.9580
C1	6	.05	0.091893	0.155152	0.241616	0.348695	0.468971	0.755979	0.927108	0.998349
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
T	6	.05	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
	$e_{c_1,t}$		0.9595	0.9576	0.9559	0.9544	0.9531	0.9511	0.9507	0.9542
C1	7	.05	0.096909	0.169828	0.270484	0.393980	0.528795	0.821065	0.960526	0.999652
T	6	.05	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
T	7	.05	0.098292	0.174075	0.279150	0.407919	0.547450	0.840864	0.969582	0.999854
	$e_{c_1,t}$		0.9611	0.9594	0.9579	0.9566	0.9555	0.9536	0.9530	0.9542

TABLE 9

HODGES-LEHMANN EFFICIENCY OF THE MEDIAN TEST

TEST	M	α	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
M	5	.01	0.017158	0.028278	0.044837	0.068465	0.100747	0.225883	0.408371	0.781944
T	3	.01	0.015886	0.024387	0.036230	0.052164	0.072895	0.149099	0.261274	0.550564
T	4	.01	0.017923	0.030556	0.049637	0.076968	0.114140	0.254781	0.450658	0.821336
	$e_{m,t}$		0.7249	0.7261	0.7284	0.7314	0.7351	0.7453	0.7553	0.7709
M	6	.01	0.018189	0.031076	0.050094	0.076553	0.111455	0.237837	0.411451	0.770401
T	3	.01				0.052164	0.072895	0.149099	0.261274	0.550564
T	4	.01	0.017923	0.030556	0.049637	0.076968	0.114140	0.254781	0.450658	0.821336
T	5	.01	0.019781	0.036604	0.063498					
	$e_{m,t}$		0.6905	0.6810	0.6722	0.6639	0.6558	0.6399	0.6322	0.6353
M	7	.01	0.020575	0.038988	0.068296	0.111067	0.168485	0.365057	0.582377	0.871569
T	4	.01							0.450658	0.821336
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
T	6	.01	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032		
	$e_{m,t}$		0.7792	0.7708	0.7622	0.7531	0.7434	0.7154	0.6847	0.6313
M	5	.05	0.077591	0.114247	0.160195	0.214768	0.276485	0.448204	0.618812	0.872697
T	2	.05						0.270725	0.383889	0.617222
T	3	.05	0.075244	0.108982	0.152139	0.205016	0.267114	0.451838	0.645202	0.909800
T	4	.05	0.081918	0.127045	0.186890	0.261375	0.348431			
	$e_{m,t}$		0.6703	0.6583	0.6464	0.6346	0.6230	0.5960	0.5798	0.5746
M	6	.05	0.083807	0.132579	0.198098	0.280010	0.375315	0.633004	0.838271	0.987563
T	4	.05	0.081918	0.127045	0.186890	0.261375	0.348431	0.591364	0.801534	0.980600
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
	$e_{m,t}$		0.7202	0.7226	0.7247	0.7264	0.7280	0.7315	0.7347	0.7418
M	7	.05	0.083271	0.130294	0.192402	0.269277	0.358617	0.605501	0.814960	0.983917
T	4	.05	0.081918	0.127045	0.186890	0.261375	0.348431	0.591364	0.801534	0.980600
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
	$e_{m,t}$		0.6043	0.5996	0.5959	0.5932	0.5914	0.5903	0.5927	0.6021

TABLE 10

HODGES-LEHMANN EFFICIENCY OF THE KOLM.-SMIRNOV TEST

TEST	M	α	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
KS	5	.01	0.018186	0.031279	0.051015	0.079107	0.116956	0.257104	0.447080	0.803946
T	3	.01							0.261274	0.550564
T	4	.01	0.017923	0.030556	0.049637	0.076968	0.114140	0.254781	0.450658	0.821336
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215		
	$e_{ks,t}$		0.8283	0.8239	0.8199	0.8161	0.8126	0.8042	0.7962	0.7872
KS	6	.01	0.020094	0.037505	0.065212	0.105975	0.161541	0.359811	0.592286	0.898963
T	4	.01						0.254781	0.450658	0.821336
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
T	6	.01	0.021529	0.042625	0.077818	0.131391	0.205877			
	$e_{ks,t}$		0.8632	0.8583	0.8533	0.8481	0.8427	0.8266	0.8088	0.7747
KS	7	.01	0.020808	0.039954	0.071048	0.117447	0.181230	0.408721	0.666931	0.956515
T	5	.01	0.019781	0.036604	0.063498	0.103497	0.158904	0.364215	0.616745	0.941108
T	6	.01	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
	$e_{ks,t}$		0.7982	0.7938	0.7896	0.7857	0.7822	0.7749	0.7701	0.7671
KS	5	.05	0.082306	0.128125	0.188976	0.264698	0.353035	0.597811	0.806519	0.981022
T	4	.05	0.081918	0.127045	0.186890	0.261375	0.348431	0.591364	0.801534	0.980600
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
	$e_{ks,t}$		0.8132	0.8131	0.8130	0.8128	0.8126	0.8120	0.8111	0.8055
KS	6	.05	0.086093	0.138243	0.207750	0.293380	0.391119	0.645811	0.840851	0.985292
T	4	.05	0.081918	0.127045	0.186890	0.261375	0.348431	0.591364	0.801534	0.980600
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
	$e_{ks,t}$		0.7850	0.7798	0.7746	0.7693	0.7641	0.7514	0.7394	0.7173
KS	7	.05	0.089200	0.147312	0.226064	0.323762	0.434871	0.713343	0.900265	0.996589
T	5	.05	0.087800	0.143539	0.219105	0.313330	0.421448	0.698489	0.891583	0.996038
T	6	.05	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
	$e_{ks,t}$		0.7513	0.7489	0.7468	0.7449	0.7433	0.7404	0.7389	0.7390

TABLE 11

HODGES-LEHMANN EFFICIENCY OF THE WILCOXON TEST

UNEQUAL SAMPLE SIZES

TEST	M N	α	D=.2	D=.4	D=.6	D=.8	D=1.0	D=1.5	D=2.0	D=3.0
W	7 6	.01	0.021969	0.044123	0.081268	0.137780	0.215906	0.486111	0.758507	0.982911
T	6 6	.01	0.021529	0.042625	0.077818	0.131391	0.205877	0.469032	0.745116	0.982808
T	7 6	.01	0.022323	0.045462	0.084711	0.144908	0.228461	0.515365	0.792557	0.990688
$e_{W,t}$			0.9657	0.9637	0.9616	0.9594	0.9572	0.9514	0.9448	0.9241
W	7 7	.01	0.022801	0.047134	0.088646	0.152294	0.240128	0.535000	0.807526	0.991453
T	7 6	.01	0.022323	0.045462	0.084711	0.144908	0.228461	0.515365	0.792557	0.990688
T	7 7	.01	0.023203	0.048671	0.092592	0.160375	0.254070	0.564531	0.836812	0.995400
$e_{W,t}$			0.9674	0.9658	0.9642	0.9627	0.9611	0.9571	0.9527	0.9402
W	7 6	.05	0.094004	0.161336	0.253863	0.368148	0.497769	0.786447	0.944320	0.999198
T	6 6	.05	0.093207	0.159116	0.249725	0.362029	0.487576	0.779866	0.942029	0.999225
T	7 6	.05	0.095613	0.166161	0.263590	0.383781	0.516275	0.810595	0.957015	0.999643
$e_{W,t}$			0.9486	0.9473	0.9460	0.9447	0.9504	0.9396	0.9348	0.9181
W	7 7	.05	0.096541	0.168787	0.268527	0.391084	0.525236	0.818054	0.959479	0.999646
T	7 6	.05	0.095613	0.166161	0.263590	0.383781	0.516275	0.810595	0.957015	0.999643
T	7 7	.05	0.098292	0.174075	0.279150	0.407919	0.547450	0.840864	0.969582	0.999854
$e_{W,t}$			0.9533	0.9523	0.9512	0.9502	0.9491	0.9462	0.9426	0.9296

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Chapter III Sequential Two-Sample Rank Tests of the Normal Shift Hypothesis

1. Summary

Two sequential two-sample rank tests, developed by Wilcoxon, Rhodes and Bradley (1963) are described. For both tests observations are taken in groups of (m+n), m from one population and n from the other, and the observations are ranked within groups. Tables are presented which facilitate the use of these tests in the case of the normal shift alternative hypothesis. Values of the operating characteristic functions and average sample number functions are given for the two tests.

2. Introduction

The general testing situation considered here is as follows. The random variables $X_1, \ldots, X_m$ and $Y_1, \ldots, Y_n$ are mutually independent. The X's [Y's] have a common continuous cumulative distribution function $F(x)$ [$G(x)$]. The null hypothesis is $H_0: G(x) = F(x)$. A particular alternative which has received rather extensive consideration is the Lehmann alternative,

$$H_L: G(x) \equiv F^k(x), \quad k \geq 0 .$$

Savage (1956) has presented several non-sequential nonparametric tests of the null hypothesis against the Lehmann alternative in detail with a table, analogous to Table A, giving the distribution of rank orders under H_L and with a table of the power function of these tests. The sequential two-sample rank procedures of Wilcoxon, Rhodes and Bradley are derived for this same

alternative. The present work treats both of these problems for the case of the normal shift alternative hypothesis; power functions of non-sequential tests were given in Chapter II and sequential tests are described in this chapter.

3. <u>The Sequential Tests</u>

Consider the situation where the random variables X and Y are normally and independently distributed with means θ_x and θ_y, respectively, and variance 1. Denoting the cumulative distribution functions of X and Y by F(x) and G(y) we wish to use a sequential rank test of the null hypothesis H_0 against the alternative hypothesis H_1:

$$(3.1) \qquad \begin{aligned} H_0&: \quad G(x) \equiv F(x) \\ H_1&: \quad G(x) \equiv F(x-D_1), \text{ where } D_1 = \theta_y - \theta_x > 0 \end{aligned}$$

with Type I and Type II errors α and β respectively. Applying the methods of Wald's sequential analysis (Wald, 1949), the procedure is as follows. Two constants A and B ($0 < B < 1 < A$) are chosen to be $A = (1-\beta)/\alpha$ and $B = \beta/(1-\alpha)$. At each stage or trial of the sequential procedure a group of $(m+n)$ independent observations is taken consisting of m X-observations and n Y-observations. The $(m+n)$ observations are ranked within each group and a probability (likelihood) ratio is computed for the group. The probability ratio for the $t^{\underline{th}}$ group is denoted by

$$(3.2) \qquad p_t = \frac{P_1}{P_0}$$

where $P_0(P_1)$ is the probability density of the observed group ranking under

the hypothesis $H_0(H_1)$. If the vector of ranked observations is denoted by $u = (u_1, u_2, \ldots, u_{m+n})$ then a new vector $z = (z_1, z_2, \ldots, z_{m+n})$ can be formed by letting $z = 0(1)$ if u_i is an X(Y)-observation, $(i = 1, \ldots, m+n)$. The probability densities of the observed group ranking are then further denoted by

$$P_1 = P_{m,n}(z|D_1) \text{ and } P_0 = P_{m,n}(z|0), \tag{3.3}$$

where these quantities are to be found in Table A.

The Wald sequential probability ratio, denoted by r_t when t groups have been observed, is given by

$$r_t = \prod_{i=1}^{t} p_i = r_{t-1}\, p_t \qquad (t=1, 2, \ldots) \tag{3.4}$$

where $r_0 = 1$. The possible situations

$$\begin{aligned} &\text{i)} \quad B < r_t < A \\ &\text{ii)} \quad r_t \geq A \\ &\text{iii)} \quad r_t \leq B \end{aligned} \tag{3.5}$$

determine the three respective actions to be taken, which are

i) continue the experiment by going to the $(t+1)^{\underline{st}}$ stage,

ii) terminate the process with the rejection of H_0, and

iii) terminate the process with the acceptance of H_0.

It is often computationally useful in application of sequential tests of this type to use logarithms and to replace (3.5) by

3.2 ... consisting (3.

... sequential ...

(3.2)

(3.3) $(m=1, 2, \ldots)$

(3.4)

... the hypotheses $H_0(H_1)$ ... ranked ...

$$
(3.6) \qquad \begin{array}{rl} \text{i)} & \log B < \log r_t < \log A \\ \text{ii)} & \log r_t \geq \log A \\ \text{iii)} & \log r_t \leq \log B \end{array}
$$

where in this presentation log refers to logarithm to the base 10. This procedure has actual Type I and II errors α' and β' which Wald (3:27) has shown satisfy the inequality $\alpha' + \beta' \leq \alpha + \beta$, thus concluding that the differences $\alpha' - \alpha$ and $\beta' - \beta$ are small enough to be ignored for all practical purposes.

The two sequential rank tests considered by Wilcoxon, Rhodes and Bradley provide as r_t the following ratios. The first of these is the "configural rank test" which is based upon the probability-ratio statistic $r_t^{(1)}$ whose value depends on the probabilities of the particular configuration of ordered observations obtained for each group. For this test

$$
(3.7) \qquad p_t = \frac{P_{m,n}(z^t|D_1)}{P_{m,n}(z^t|0)} = P_{m,n}(z^t|D_1) \cdot \binom{m+n}{n}
$$

and

$$
(3.8) \qquad r_t^{(1)} = \prod_{j=1}^{t} p_j = \binom{m+n}{n}^t \prod_{j=1}^{t} P_{m,n}(z^j|D_1);
$$

here z^t denotes the z-value observed at the $t^{\underline{th}}$ stage of the experiment.

The "rank-sum test" is based on the probability-ratio statistic $r_t^{(2)}$ whose value depends on the probabilities of the within-group rank sum of the Y-observations for each group. For this test

$$(3.9) \qquad p_t = \frac{\Pr(W^t|D_1)}{\Pr(W^t|0)}$$

and

$$(3.10) \qquad r_t^{(2)} = \prod_{j=1}^{t} p_j = \prod_{j=1}^{t} \frac{\Pr(W^j|D_1)}{\Pr(W^j|0)}$$

where $W^j = W_y^j = \sum_{i=1}^{m+n} iz_i^j$, the sum of the ranks of the Y-sample at the $j^{\underline{th}}$ stage, $j = 1, 2, \ldots t$. Clearly $r_t^{(2)}$ could be written in terms of $W_x^j = \sum_{i=1}^{m+n} i(1-z_i^j)$, the sum of the ranks of X-sample at the $j^{\underline{th}}$ stage, $j = 1, 2, \ldots t$. Note that $W_x = (m+n).(m+n+1)/2 - W_y$.

4. Computation of r_t

a. Configural rank test: $r_t^{(1)}$

Computation of $r_t^{(1)}$ may be done directly from Table A. Due to the large size of Table A no attempt has been made to provide values of $\log r_t^{(1)}$. In the notation of (3.4), (3.8) may be written as

$$(4.1) \qquad r_t^{(1)} = r_{t-1}^{(1)} \cdot P_{m,n}(z|D_1).\binom{m+n}{n}$$

where $r_0^{(1)} = 1$; $P_{m,n}(z|D_1)$ and $\binom{m+n}{n} = C(m,n)$ are found in Table A.

b. Rank-sum test: $r_t^{(2)}$

Modifying slightly the notation of (3.4), (3.10) may be written as

$$p_j = \frac{\Pr(T_j|\theta)}{\Pr(T_j|D^c)} \qquad (3.9)$$

and

$$\prod_{j=1} p_j = \prod_{j=1} \frac{\Pr(T_j|\theta)}{\Pr(T_j|D^c)}$$

where $W_Y^j = \sum_{i=1} i z_i^j$, the sum of the ranks of the Y-sample at the j^{th} stage, $j = 1, 2, \ldots$. Clearly $r_{(2)}$ could be written in terms of $W_X^j = \sum_{i=1}^{m+n} i(1-z_i^j)$, the sum of the ranks of X-sample at the j^{th} stage, $j = 1, \ldots$. Note that $W_X^j = (m+n)(m+n+1)/2 - W_Y^j$.

4. Computation of $r_{(i)}$

a. Generalized sign test: $r_{(1)}$

Computation of $r_{(1)}$ may be done directly from Table [illegible]. Due to the large size of Table [illegible], no attempt has been made to provide values of $r_{(1)}$. In the notation of (2.4), (3.3) may be written as

$$r_{(1)} = [illegible] \qquad (4.1)$$

where $r_{(1)} = [illegible]$, $P_{m,n}(n|\theta)$, and $\binom{m+n}{n} = c(m,n)$ are found in T[illegible].

b. Rank-sum test: $r_{(2)}$

Modifying slightly the notation of (3.6), (3.10) may be [illegible] as

$$(4.2) \qquad r_t^{(2)} = r_{t-1}^{(2)} \cdot \frac{\Pr(W^t|D_1)}{\Pr(W^t|0)} \equiv r_{t-1}^{(2)} R(W^t|D_1)$$

or, taking logarithms, as

$$(4.3) \qquad \log r_t^{(2)} \equiv \log r_{t-1}^{(2)} + \log R(W^t|D_1),$$

where $r_0^{(2)} \equiv 1$ and $\log r_0^{(2)} \equiv 0$. Table C-1, derived from Table A, gives the distribution of W under the hypotheses D = 0(.2)1,1.5,2,3. Both W_y and W_x are given to facilitate use of the table. Table C-2 gives values of log $R(W|D)$ for D = .2(.2)1,1.5,2,3. Both tables are for sample sizes $1 \leq n \leq m \leq 7$.

5. Properties of the Sequential Tests

The Wald sequential analysis provides two concepts which describe the properties of sequential tests and measure their performance: the OC-function and ASN-function.

a. The Operating Characteristic Function (OC-function).

The OC-function L(D) is the probability of accepting H_0 when D is the true value of the shift in location between the two populations. Wald's formulas (3:29a) and (3:43) provide approximations to L(D) at two points: $L(0) \doteq 1 - \alpha$ and $L(D_1) \doteq \beta$. However, these points provide no way to compare performance of two tests. A third point at which an approximation to L(D) may be relatively easily evaluated is at D = D', where D' is such that $\mathcal{E}_{D'}(\log r_1) = 0$. [See Wald (1947), Appendix A. 3.1]. From Wald's formula (A:98),

... Wald (19..), Appendix A. 7.1]. From that formula

... derivatives is at $D = D'$, where D' is such that

... at which an approximation to $L(D)$

$L(0) = 1 -$ ... and $L(D_1)$ ... compare

... and ... $L(D)$ ...

... the shift is forced ...

... -function $L(D)$ is ... when D is the

... Operating Characteristic ... (OC-function) ...

... properties ... tests and ... their performance ... the OC-function

... analysis provide ... describe the

... Tests

For ... $D =$ ... 2.5 ... $1 \leq n \leq 7$.

... Table 6-2 gives values of log $B(w|D)$

... $D = (0.25)$ ... and W_n

(2) : 1 and for ... Table 6-1 ... gives the

... + log ...

and hence ...

(A.8) ... (2) ...

$$L(D') \doteq \frac{\log [(1-\beta)/\alpha]}{\log [(1-\beta)/\alpha] - \log [\beta/(1-\alpha)]} .$$

Values of D' were obtained by inverse interpolation with a $5^{\underline{th}}$ degree polynomial among values of $\mathcal{E}_D(\log r_1)$.

As observed by Wilcoxon, Rhodes and Bradley for the test with Lehmann alternative, the value of D' is not very dependent on m and n when $1 \leq n \leq m \leq 7$ for both tests. Further, the values of D' are essentially the same for both tests, given m, n and D_1. Table 1 gives the values of D' for m = n = 1(1)7 for the rank-sum test for D_1 = .2(.2)1,1.5,2,3. For m = n = 1(1)5 only 1 case was found in which the configural rank test gave a result differing by more than one in the third decimal place.

Table 1

Values of D' such that $\mathcal{E}_{D'}(\log r_1) = 0$, for alternative hypotheses D_1 = .2(.2)1,1.5,2,3.

	D_1							
m=n	0.2	0.4	0.6	0.8	1.0	1.5	2.0	3.0
1	.100	.200	.299	.398	.495	.734	.961	1.374
2	.100	.200	.299	.399	.497	.740	.976	1.415
3	.100	.200	.300	.399	.498	.743	.982	1.434
4	.100	.200	.300	.399	.498	.744	.986	1.445
5	.100	.200	.300	.399	.499	.745	.988	1.452
6	.100	.200	.300	.399	.499	.746	.989	1.456
7	.100	.200	.300	.399	.499	.746	.990	1.459

$$f(D_i) = \frac{\ldots}{\ldots}$$

... [illegible] ... degree polynomial

mean value of [illegible]

As observed ... and Bradley ... the test than Lehmann ...

alternative ... depends ... $\lambda \leq \ldots$

for both tests ... are essentially the same ... which

test ... given ... gives the value of θ ... $= \ldots (1)$;

for the ranks ... $= \ldots (1)$ ... case

was found in which ... differ by more

than one in the third decimal place.

Table

Values of D_i' such that $\phi_{D_i'}$ ... for ... alternative

hypothesis $D_i = 2(.2)1.8, 2, \ldots$

D_i

m=n	0.1	0.2	0.4	0.8	[illegible]	1.2	[illegible]	2.0
1	[illegible]	[illegible]	[illegible]	.398	.405	[illegible]	.961	[illegible]
2	[illegible]	[illegible]	.399	[illegible]	.497	[illegible]	.976	[illegible]
3	[illegible]	[illegible]	[illegible]	.399	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	.399	[illegible]	.744	.986	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	.399	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	.399	[illegible]	[illegible]	.996	[illegible]

b. The Average Sample Number Function (ASN-function)

The ASN-function, generally of more interest in sequential tests than the OC-function, gives the average (or expected) sample sizes required for termination of the test for various true values of D. Although the values of the ASN-function depend upon D_1, α, β and D, it is convenient to follow the notation of Wilcoxon, Rhodes and Bradley and write the function as ASN(D). Wald gives approximate formulas for ASN(D) for $D \neq D'$ (3:57) and $D = D'$ (A:99) which, in the notation of this chapter, are

$$\text{(5.1)} \qquad ASN(D) \doteq \frac{L(D) \quad \log\,[\beta/(1-\alpha)] + [1-L(D)]\,\log\,[(1-\beta)/\alpha]}{\mathcal{E}_D(\log r_1)}$$

and

$$\text{(5.2)} \qquad ASN(D') \doteq \frac{-\,\log\,[\beta/(1-\alpha)]\,\log\,[(1-\beta)/\alpha]}{\mathcal{E}_{D'}(\log^2 r_1)}$$

where r_1 is $r(z|D_1)$ or $R(W|D_1)$ and $\mathcal{E}_D$ and $\mathcal{E}_{D'}$ denote expectation with respect to the subscript value of the shift parameter. Using Tables C-1 and C-2, these expectations are computed in the usual way for discrete probability distributions by summing the products of the possible values of log r (and $\log^2$ r) and the corresponding probabilities of r based upon the appropriate value of D.

As noted by Wilcoxon, Rhodes and Bradley, the values of ASN(D) from (5.1) and (5.2) are in terms of the number of groups of size m+n of observations required (or in terms of the number of stages, t). Modifying

... required (or in terms of ... sec. c). Modifying ... (6.2) ... in terms of ... its own ... As noted ... the values ... (b) from

... the appropriate value ... (and log r) ... expectation are ... the usual ... criteria ... to the subscript ... (6.2), these where ... is (s|p) ... and ... with respect

(6.3) [illegible]

and

(6.4) [illegible]

... approximate formulas for ASN(θ) for θ ≠ 0, (6.5) ... and Bradley ... as ASN(θ) ... constant to follow ... the values ... the value ... also required for ... in sequential ... (ab-function) their procedure slightly, ASN(D) is converted to the average total number of observations needed, rather than to the average number of Y-observations, thus providing for the case $m \neq n$. In Table 2 values of $(m+n) \cdot$ ASN(D) are given for the rank-sum test (based on $r_t^{(2)}$) when $\alpha = \beta = .05$ and $\alpha = \beta = .01$ for $D_1 = .2(.2)\ 1,\ 1.5,\ 2,\ 3$ and $m = n = 1(1)7$. The function is computed for $D = 0$, D', and D_1. Table 3 provides values of $\mathcal{E}_D(\log r_1)$, $D = 0$, D_1, and $\mathcal{E}_{D'}(\log^2 r_1)$ for the rank-sum test to facilitate calculation of ASN(D) for other values of α and β.

In Table 2, four cases were found in which the ASN for the rank-sum test differs from (is greater than) that of the configural rank test by from one to three multiples of the total group size, $m = n = 1(1)5$. These cases are marked with an asterisk. For both $\alpha = \beta = .05$ and $\alpha = \beta = .01$ it is seen that the approximately optimum group size shows a slight tendency to decrease as D_1, the alternative hypothesis, increases.

It is interesting to compare average sample numbers from Table 2 with the sample sizes required for a non-sequential _t_-test with the same α and β, as given below in Table 4 (Davies, 1956; Table E.1). These sequential tests have optimum (best choice of group sizes) average sample numbers which are generally about 50-60% of the sample size of the non-sequential _t_ test.

Table 2

Values for the ASN-function converted to total sample sizes

for the rank-sum test

$\alpha = \beta = .01$

M=N	D_0	D'	D_1
	H_0: D = 0		H_1: D_1 = .2
1	1396.9	3318.8	1396.9
2	1185.3	2746.6	1185.3
3	1096.7	2569.4	1107.0*
4	1057.1	2489.1*	1064.3
5	1034.8	2428.4*	1040.3*
6	1020.4	2401.5	1024.8
7	1010.3	2372.6	1014.1
	H_0: D = 0		H_1: D_1 = .4
1	355.6	829.7	358.8
2	294.1	692.6	299.7
3	274.8	647.6	279.4
4	265.2	624.7	269.3
5	259.4	610.8	263.6
6	255.4	601.1	259.6
7	252.6	594.4	256.6
	H_0: D = 0		H_1: D_1 = .6
1	157.7	372.2	163.7
2	130.8	309.9	135.8
3	122.2	288.9	126.7
4	117.9	279.0	122.1
5	115.3	272.8	119.4
6	113.6	268.6	117.6
7	112.4	265.6	116.3
	H_0: D = 0		H_1: D_1 = .8
1	88.9	211.8	94.9
2	73.7	175.6	78.7
3	68.8	163.8	73.3
4	66.4	158.0	70.6
5	64.9	154.5	69.0
6	63.9	152.2	68.0
7	63.2	150.5	67.2

Table 2 (continued)

Values for the ASN-function converted to total sample sizes for the rank-sum test

$\alpha = \beta = .01$

M=N	D_0	D'	D_1
	H_0: D = 0		H_1: D_1 = 1.0
1	57.0	137.1	63.3
2	47.2	113.5	52.3
3	44.0	105.8	48.6
4	42.5	102.1	46.8
5	41.6	99.8	45.7
6	40.9	98.3	45.0
7	40.5	97.2	44.5
	H_0: D = 0		H_1: D_1 = 1.5
1	25.6	63.3	32.1
2	21.1	52.1	26.3
3	19.6	48.5	24.4
4	18.9	46.8	23.4
5	18.5	45.7	22.9
6	18.2	45.0	22.5
7	18.0	44.5	22.2
	H_0: D = 0		H_1: D_1 = 2.0
1	14.5	37.4	21.6
2	11.9	30.6	17.5
3	11.1	28.4	16.1
4	10.7	27.4	15.4
5	10.5	26.7	15.0
6	12.0**	26.3	14.7
7	14.0**	26.0	14.5
	H_0: D = 0		H_1: D_1 = 3.0
1	6.7	18.5	14.8
2	5.4	15.0	11.7
3	6.0**	13.9	10.7
4	8.0**	13.4	10.1
5	10.0**	13.1	10.0**
6	12.0**	12.9	12.0**
7	14.0**	14.0**	14.0**

** For cases of large m, n and D_1 marked ** the tabled value is the minimum possible sample size since this value is greater than the ASN calculated from (5.1).

for the rank-sum test.

[illegible]

… calculated from (3.1).

Table 2 (continued)

Values for the ASN-function converted to total sample sizes

for the rank-sum test

$\alpha = \beta = .05$

M=N	D_0	D'	D_1
	H_0: D = 0		H_1: D_1 = .2
1	822.1	1362.7	822.1
2	697.5	1127.7	697.5
3	645.4	1055.0	651.4
4	622.1	1022.0	626.3
5	608.9	997.1	612.2
6	600.5	986.1	603.1
7	594.5	974.2	596.8
	H_0: D = 0		H_1: D_1 = .4
1	209.3	340.7	211.2
2	173.1	284.4	176.4
3	161.7	265.9	164.4
4	156.1	256.5	158.5
5	152.6	250.8	155.1
6	150.3	246.8	152.8
7	148.6	244.1	151.0
	H_0: D = 0		H_1: D_1 = .6
1	92.8	152.8	96.3
2	77.0	127.3	79.9
3	71.9	118.6	74.6
4	69.4	114.6	71.9
5	67.9	112.0	70.3
6	66.8	110.3	69.2
7	66.1	109.1	68.4
	H_0: D = 0		H_1: D_1 = .8
1	52.3	87.0	55.9
2	43.4	72.1	46.3
3	40.5	67.2	43.1
4	39.1	64.9	41.6
5	38.2	63.4	40.6
6	37.6	62.5	40.0
7	37.2	61.8	39.5

Table 2 (continued)

Values for the ASN-function converted to total sample sizes

for the rank-sum test

$\alpha = \beta = .05$

M=N	D_0	D'	D_1
	$H_0: D = 0$		$H_1: D_1 = 1.0$
1	33.6	56.3	37.2
2	27.8	46.6	30.8
3	25.9	43.5	28.6
4	25.0	41.9	27.6
5	24.5	41.0	26.9
6	24.1	40.3	26.5
7	23.8	39.9	26.2
	$H_0: D = 0$		$H_1: D = 1.5$
1	15.0	26.0	18.9
2	12.4	21.4	15.5
3	11.6	19.9	14.4
4	11.1	19.2	13.8
5	10.9	18.8	13.5
6	12.0**	18.5	13.2
7	14.0**	18.3	14.0**
	$H_0: D = 0$		$H_1: D_1 = 2.0$
1	8.6	15.3	12.7
2	7.0	12.6	10.3
3	6.5	11.7	9.5
4	8.0**	11.2	9.1
5	10.0**	11.0	10.0**
6	12.0**	12.0**	12.0**
7	14.0**	14.0**	14.0**
	$H_0: D = 0$		$H_1: D_1 = 3.0$
1	3.9	7.6	8.7
2	4.0**	6.1	6.9
3	6.0**	6.0**	6.3
4	8.0**	8.0**	8.0**
5	10.0**	10.0**	10.0**
6	12.0**	12.0**	12.0**
7	14.0**	14.0**	14.0**

** For cases of large m, n, and D_1 marked ** the tabled value is the minimum possible sample size since this value is greater than the ASN calculated from (5.1).

TABLE 3

VALUES OF $A = \mathcal{E}_{D=0}(\text{LOG } R_1)$, $B = \mathcal{E}_{D=D'}(\text{LOG}^2 R_1)$ AND $C = \mathcal{E}_{D=D_1}(\text{LOG } R_1)$ FOR THE SEQUENTIAL RANK-SUM TEST

		$D_1 = .2$			$D_1 = .4$		
M	N	A	B	C	A	B	C
1	1	-0.0028	0.0024	0.0028	-0.0110	0.0096	0.0109
2	1	-0.0041	0.0036	0.0041	-0.0166	0.0143	0.0163
3	1	-0.0050	0.0043	0.0050	-0.0199	0.0172	0.0196
2	2	-0.0066	0.0058	0.0066	-0.0266	0.0230	0.0261
4	1	-0.0055	0.0048	0.0055	-0.0222	0.0192	0.0219
3	2	-0.0083	0.0072	0.0083	-0.0332	0.0287	0.0327
5	1	-0.0060	0.0052	0.0059	-0.0238	0.0206	0.0235
4	2	-0.0095	0.0082	0.0094	-0.0379	0.0328	0.0373
3	3	-0.0107	0.0093	0.0106	-0.0427	0.0369	0.0420
6	1	-0.0063	0.0054	0.0062	-0.0251	0.0217	0.0248
5	2	-0.0104	0.0090	0.0103	-0.0415	0.0359	0.0409
4	3	-0.0124	0.0108	0.0124	-0.0498	0.0431	0.0490
7	1	-0.0065	0.0057	0.0065	-0.0260	0.0226	0.0257
6	2	-0.0111	0.0096	0.0110	-0.0443	0.0383	0.0436
5	3	-0.0138	0.0120	0.0138	-0.0553	0.0478	0.0544
4	4	-0.0148	0.0128	0.0147	-0.0590	0.0510	0.0581
7	2	-0.0116	0.0101	0.0116	-0.0465	0.0402	0.0458
6	3	-0.0149	0.0130	0.0149	-0.0597	0.0517	0.0588
5	4	-0.0166	0.0144	0.0165	-0.0664	0.0574	0.0653
7	3	-0.0158	0.0137	0.0158	-0.0633	0.0548	0.0624
6	4	-0.0181	0.0157	0.0180	-0.0724	0.0626	0.0713
5	5	-0.0189	0.0164	0.0188	-0.0754	0.0652	0.0742
7	4	-0.0194	0.0168	0.0193	-0.0774	0.0670	0.0762
6	5	-0.0207	0.0180	0.0207	-0.0829	0.0718	0.0817
7	5	-0.0223	0.0194	0.0222	-0.0893	0.0773	0.0879
6	6	-0.0230	0.0199	0.0229	-0.0919	0.0795	0.0904
7	6	-0.0249	0.0216	0.0248	-0.0995	0.0861	0.0980
7	7	-0.0271	0.0235	0.0270	-0.1084	0.0938	0.1067

TABLE 3 (CONTINUED)

VALUES OF $A = \sum_{D=0} (\text{LOG } R_1)$, $B = \sum_{D=D'} (\text{LOG}^2 R_1)$ AND $C = \sum_{D=D_1} (\text{LOG } R_1)$ FOR THE SEQUENTIAL RANK-SUM TEST

		$D_1 = .6$			$D_1 = .8$		
M	N	A	B	C	A	B	C
1	1	-0.0248	0.0214	0.0239	-0.0440	0.0376	0.0412
2	1	-0.0373	0.0321	0.0359	-0.0662	0.0566	0.0621
3	1	-0.0448	0.0386	0.0433	-0.0796	0.0681	0.0749
2	2	-0.0598	0.0514	0.0576	-0.1061	0.0907	0.0994
4	1	-0.0499	0.0430	0.0483	-0.0887	0.0759	0.0838
3	2	-0.0746	0.0642	0.0720	-0.1326	0.1133	0.1244
5	1	-0.0536	0.0462	0.0520	-0.0952	0.0816	0.0902
4	2	-0.0853	0.0735	0.0824	-0.1516	0.1296	0.1425
3	3	-0.0960	0.0827	0.0926	-0.1706	0.1459	0.1601
6	1	-0.0564	0.0486	0.0548	-0.1002	0.0860	0.0952
5	2	-0.0933	0.0804	0.0902	-0.1657	0.1418	0.1561
4	3	-0.1119	0.0964	0.1080	-0.1989	0.1701	0.1868
7	1	-0.0586	0.0506	0.0570	-0.1041	0.0894	0.0991
6	2	-0.0995	0.0857	0.0963	-0.1768	0.1514	0.1669
5	3	-0.1244	0.1071	0.1201	-0.2210	0.1890	0.2078
4	4	-0.1327	0.1142	0.1281	-0.2357	0.2016	0.2215
7	2	-0.1045	0.0901	0.1012	-0.1857	0.1590	0.1755
6	3	-0.1343	0.1157	0.1298	-0.2386	0.2042	0.2246
5	4	-0.1492	0.1285	0.1441	-0.2652	0.2268	0.2492
7	3	-0.1424	0.1227	0.1377	-0.2531	0.2166	0.2385
6	4	-0.1628	0.1402	0.1572	-0.2893	0.2474	0.2721
5	5	-0.1696	0.1460	0.1638	-0.3013	0.2578	0.2833
7	4	-0.1741	0.1499	0.1682	-0.3093	0.2647	0.2912
6	5	-0.1865	0.1606	0.1802	-0.3315	0.2835	0.3117
7	5	-0.2009	0.1730	0.1941	-0.3570	0.3054	0.3358
6	6	-0.2066	0.1779	0.1996	-0.3672	0.3141	0.3453
7	6	-0.2238	0.1928	0.2162	-0.3978	0.3403	0.3741
7	7	-0.2437	0.2099	0.2355	-0.4331	0.3705	0.4074

TABLE 3 (CONTINUED)

VALUES OF A = $\mathcal{E}_{D=0}$ (LOG R_1), B = $\mathcal{E}_{D=D'}$ (LOG^2 R_1) AND C = $\mathcal{E}_{D=D}$ (LOG R_1) FOR THE SEQUENTIAL RANK-SUM TEST

		D_1 = 1.0			D_1 = 1.5		
M	N	A	B	C	A	B	C
1	1	-0.0686	0.0581	0.0618	-0.1530	0.1258	0.1217
2	1	-0.1032	0.0875	0.0934	-0.2309	0.1903	0.1855
3	1	-0.1242	0.1054	0.1131	-0.2784	0.2301	0.2261
2	2	-0.1656	0.1403	0.1497	-0.3712	0.3055	0.2973
4	1	-0.1384	0.1176	0.1267	-0.3105	0.2574	0.2549
3	2	-0.2069	0.1754	0.1875	-0.4639	0.3823	0.3737
5	1	-0.1487	0.1265	0.1367	-0.3338	0.2773	0.2765
4	2	-0.2366	0.2007	0.2150	-0.5307	0.4378	0.4301
3	3	-0.2664	0.2258	0.2413	-0.5976	0.4923	0.4812
6	1	-0.1565	0.1333	0.1444	-0.3514	0.2926	0.2936
5	2	-0.2588	0.2196	0.2358	-0.5805	0.4796	0.4736
4	3	-0.3105	0.2633	0.2818	-0.6967	0.5744	0.5630
7	1	-0.1626	0.1387	0.1506	-0.3653	0.3048	0.3074
6	2	-0.2761	0.2345	0.2523	-0.6195	0.5124	0.5085
5	3	-0.3450	0.2927	0.3136	-0.7743	0.6388	0.6279
4	4	-0.3681	0.3121	0.3341	-0.8262	0.6811	0.6676
7	2	-0.2899	0.2464	0.2657	-0.6505	0.5388	0.5372
6	3	-0.3726	0.3162	0.3393	-0.8362	0.6904	0.6809
5	4	-0.4140	0.3512	0.3761	-0.9294	0.7666	0.7525
7	3	-0.3952	0.3355	0.3605	-0.8868	0.7328	0.7252
6	4	-0.4517	0.3832	0.4107	-1.0138	0.8366	0.8229
5	5	-0.4706	0.3991	0.4275	-1.0563	0.8713	0.8555
7	4	-0.4830	0.4099	0.4398	-1.0842	0.8952	0.8825
6	5	-0.5176	0.4391	0.4705	-1.1620	0.9587	0.9422
7	5	-0.5574	0.4729	0.5070	-1.2514	1.0328	1.0164
6	6	-0.5733	0.4864	0.5212	-1.2875	1.0622	1.0440
7	6	-0.6211	0.5269	0.5648	-1.3941	1.1508	1.1320
7	7	-0.6764	0.5738	0.6151	-1.5183	1.2533	1.2329

TABLE 3 (CONTINUED)

VALUES OF A = $\sum_{D=0} (\mathrm{LOG}\ R_1)$, B = $\sum_{D=D'} (\mathrm{LOG}^2\ R_1)$ AND C = $\sum_{D=D_1} (\mathrm{LOG}\ R_1)$ FOR THE SEQUENTIAL RANK-SUM TEST

		$D_1 = 2.0$			$D_1 = 3.0$		
M	N	A	B	C	A	B	C
1	1	-0.2689	0.2132	0.1814	-0.5881	0.4299	0.2637
2	1	-0.4074	0.3242	0.2791	-0.8992	0.6618	0.4128
3	1	-0.4922	0.3935	0.3432	-1.0918	0.8107	0.5152
2	2	-0.6564	0.5208	0.4483	-1.4560	1.0651	0.6676
4	1	-0.5497	0.4414	0.3895	-1.2231	0.9160	0.5925
3	2	-0.8208	0.6524	0.5660	-1.8219	1.3366	0.8508
5	1	-0.5914	0.4768	0.4253	-1.3185	0.9950	0.6540
4	2	-0.9394	0.7481	0.6544	-2.0874	1.5357	0.9928
3	3	-1.0582	0.8406	0.7293	-2.3525	1.7229	1.1002
6	1	-0.6230	0.5041	0.4539	-1.3911	1.0569	0.7049
5	2	-1.0277	0.8202	0.7240	-2.2832	1.6852	1.1081
4	3	-1.2340	0.9815	0.8554	-2.7411	2.0134	1.2978
7	1	-0.6479	0.5259	0.4776	-1.4483	1.1069	0.7481
6	2	-1.0969	0.8771	0.7807	-2.4411	1.8039	1.2048
5	3	-1.3714	1.0919	0.9568	-3.0174	2.2361	1.4607
4	4	-1.4637	1.1642	1.0150	-3.2040	2.3849	1.5435
7	2	-1.1519	0.9229	0.8281	-2.5574	1.8982	1.2877
6	3	-1.4810	1.1806	1.0408	-3.2408	2.4168	1.5988
5	4	-1.6464	1.3105	1.1457	-3.5516	2.6816	1.7488
7	3	-1.5706	1.2535	1.1118	-3.4000	2.5601	1.7183
6	4	-1.7960	1.4306	1.2553	-3.8351	2.9261	1.9245
5	5	-1.8707	1.4899	1.3029	-3.9604	3.0479	1.9919
7	4	-1.9215	1.5312	1.3492	-4.0172	3.1232	2.0778
6	5	-2.0569	1.6396	1.4364	-4.2377	3.3486	2.2019
7	5	-2.2127	1.7665	1.5518	-4.4397	3.6017	2.3862
6	6	-2.2730	1.8162	1.5920	-4.5153	3.7016	2.4430
7	6	-2.4600	1.9683	1.7275	-4.6940	3.9939	2.6561
7	7	-2.6690	2.1433	1.8818	-4.8644	4.3344	2.8958

Table 4

Sample size required for one-sided non-sequential t test, and optimum ASN for sequential rank-sum test, for normal shift alternatives D_1.

D_1	$\alpha = \beta = .05$ Rank test H_0	H_1	t test	$\alpha = \beta = .01$ Rank test H_0	H_1	t test
.6	67	69	122			
.8	38	40	70	64	68	140
1.0	24	27	46	41	45	90
1.5	11	14	22	18	23	42
2.0	6	9	14	11	15	26
3.0	4	6	8	5	10	14

Bradley, Martin and Wilcoxon (1964) give Monte Carlo estimates of the ASN-function for the rank-sum test based on the Lehmann alternative hypothesis when the underlying distributions are normal and differ both in location and dispersion. It is difficult to make any comparison between their results and the present work because of the difference in alternative hypotheses.

6. Other Sequential Rank Tests

Two additional sequential rank tests which might be considered are tests based upon the ratios

$$r_t^{(3)} = \frac{P_{tm,tn}(z|D)}{P_{tm,tn}(z|0)} \tag{6.1}$$

and

$$r_t^{(4)} = \frac{Pr(W^t|D)}{Pr(W^t|0)} \tag{6.2}$$

$$\frac{P(R_j|0)}{P(R_j|D)}$$

and

(9.5) $$r'_{(j)} = \frac{[illegible]}{[illegible]}$$

(9.5) would [illegible] same.

The additional [illegible] test [illegible] might be considered the

9. Other Sequential Tests

the present work because [illegible] alternative hypotheses. dispersion. It is difficult [illegible] comparison between their results and than the underlying distributions [illegible] differ both in location and [illegible] for the [illegible] based on the [illegible] alternatives [illegible]

Bradley, Merchant [illegible] (1966) give Monte Carlo estimates of the

.10	[illegible]	[illegible]		5	10	16
2.0	6	6	11	11	12	[illegible]
1.5	[illegible]	[illegible]	22	16	[illegible]	[illegible]
1.0	18	22	46	41	45	90
.8	36	60	[illegible]	[illegible]	65	140
0	65	73	142			

δ_1 Rank test [illegible] Rank test t test

$\alpha = \beta = .05$ $\alpha = \beta = .01$

[illegible] rank-sum test for normal shift alternatives [illegible]

[illegible] on [illegible]-sided non-sequential t test, and [illegible] where z and W^t at the $t^{\underline{th}}$ stage are based upon the ranks of all $t(m+n)$ observations (i.e., all observations are re-ranked with respect to each other at each stage). Thus, $z = (z_1, z_2, \ldots, z_{t(m+n)})$ and $W^t = \sum_{i=1}^{t(m+n)} iz_i$. Properties of these tests are of interest because it seems reasonable to expect that a test based on the ranks of all available observations relative to each other should be more economical than one in which only the ranks of observations relative to each stage are used. However, the non-independence of the successive ratios indicates that in this case the usual Wald sequential procedure requires some justification. Table A and Table C-2 provide the means for evaluation of $r_t^{(3)}$ and $r_t^{(4)}$ for several stages of an experiment (up to seven stages in case $m = n = 1$).

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Chapter IV Application of Rank Order Probabilities to Other Problems

1. A Selection Procedure

a. Introduction

A single sample multiple decision procedure for ranking or selecting normal populations according to the magnitude of the population means is presented by Bechhofer(1954). A particular problem to which Bechhofer applies this procedure is presented as follows, in his notation.

Let X_i be normally and independently distributed random variables with unknown means μ_i and common known variance σ^2, $(i = 1, \ldots, k)$. The ranked μ_i are denoted $\mu_{[1]} \leq \mu_{[2]} \leq \cdots \leq \mu_{[k]}$; it is assumed that it is not known which population is associated with $\mu_{[i]}$, $(i = 1, \ldots, k)$. On the basis of N independent observations from each of the k populations we wish to make an inference about the ordering of the populations according to the magnitude of the means; we may say the "best" population has the largest mean, the "second best" population has the second largest mean, etc. This procedure bases the inference on the sample means. The sample mean from the $i^{\underline{th}}$ population is denoted by $\overline{X}_i$, and the ranked $\overline{X}_i$ are denoted by $\overline{X}_{[1]} < \overline{X}_{[2]} < \cdots < \overline{X}_{[k]}$.

The goal of this procedure is to find

(1.1) any s of the t "best" populations $(1 \leq s \leq t)$.

The procedure is to take N observations from each population and compute the k sample means, $\overline{X}_1, \overline{X}_2, \ldots, \overline{X}_k$. The means are ranked and the statement is made that the populations associated with the s largest sample means form a subset of the t "best" populations. The number of observations N from each population is to be chosen so that the preceding statement is

correct with at least a specified probability P^* under certain parameter configurations. Mahamunulu (1965) has shown that to guarantee a probability of correct selection (correct statement) $\geq P^*$ whenever

$$\mu_{[k-t+1]} - \mu_{[k-t]} \geq \delta^* \quad \left(\binom{t}{s}^{-1} < P^* < 1,\ \delta^* > 0,\right.$$

where P^* and δ^* are preassigned$\Big)$, N should be at least equal to the smallest integer equal to or greater than the solution (in m) of

$$(1.2) \quad P^* = \frac{t!}{(t-s)!\,(s-1)!} \int_{-\infty}^{\infty} [F(y+d)]^{k-t} [F(y)]^{t-s} [1-F(y)]^{s-1} f(y)dy$$

where $d = \frac{\delta^*\sqrt{m}}{\sigma}$ and F(y) and f(y) are the standard normal cumulative distribution function and density function, respectively. Bechhofer (1954) gives (1.2) and a table of d for the case t = s, for various values of P^*, k and t. His table is based upon an unpublished table by Teichroew (1954) of the integral (1.2) with t = s which was computed for this purpose.

A second goal might be to select a subset of s populations such that

(1.3) at least c of the t "best" populations are among the s populations ($c \leq s, t$).

This goal differs from the first in that it allows inclusion among the selected populations of some that are not "best". The discussion pertaining to the first goal also applies here, except that two choices of procedure are now available. In both procedures one chooses the s populations corresponding to the s largest means and the statement is made that at least

c of the "best" populations are among the s populations chosen. In one procedure, s is fixed and N is chosen large enough so that the probability of a correct statement is $\geq P^*$. In the second procedure, N is fixed and s is chosen large enough so that the probability of a correct statement is $\geq P^*$. This goal is related to that considered by Gupta and Sobel (1958), namely, to select a subset from among k populations such that the probability that all populations better than a standard are included in the subset is $\geq P^*$.

b. A table for use in selection procedures

Solutions to the procedures involving goals (1.1) and (1.3) may be had in terms of Table A. However, a special summary table, Table D, is provided to facilitate these solutions.

Table A provides values of

$$(1.4) \qquad P_{m,n}(z \mid D),$$

the probability of the rank order $z = (z_1, z_2, \ldots, z_{m+n})$ where z is associated with the ranked observations in a combined sample of size m + n in which m X-observations are from a standard normal distribution and n Y-observations are from a normal distribution with mean D and variance 1, all m + n observations being mutually independent. If the vector of ranked observations is denoted $u = (u_1, u_2, \ldots, u_{m+n})$ then $z_i = 0(1)$ if u_i is an X(Y)-observation ($i = 1, \ldots, m+n$).

Now, let the probability that at least n_1 of the ones in the vector z are among the r rightmost elements $z_{m+n-r+1}, z_{m+n-r+2}, \ldots, z_{m+n-1}, z_{m+n}$ be denoted by $P(n_1; r, m, n, D)$. This is expressed in terms of (1.4) as

... the "best" ... the ...

... probability

... the same ... procedure, ...

... probability of a correct selection is

... any ...

namely ... values ...

... (1.3) may be

... in terms of Table A. However, a special summary table, Table B, is provided to facilitate ...

Table A provides values of

(1.5) $P_m(a \mid \theta)$,

the probability of the ordered ... $a = (a_1, a_2, \ldots)$ ...

associated with ...

... which m Z-observations ...

... observations and ...

... m + ... vector of

... $a = (a_1, a_2, \ldots)$ ...

... (1.4) as

$$(1.5) \qquad P(n_1;\ r,\ m,\ n,\ D) = \sum_{\underset{\sim}{z}} P_{m,n}(z \mid D)$$

for $n_1 \leq n$, r; the summation is over the set $\underset{\sim}{z}$ of (m+n)-element z-vectors with at least n_1 ones among the s rightmost elements.

Values of $P(n_1;\ r,\ m,\ n,\ D)$ are given in Table D to 6 decimal places for $1 \leq n \leq m \leq 7$ and $n = 1$, $m = 8(1)12$; $r = 1(1)\ [m/2]$; $n_1 = 1(1)\ n$; and $D = 0(.2)\ 1, 1.5, 2, 3$.

Solution to the selection procedure in terms of the first goal (1.1) may be had by solving

$$(1.6) \qquad P^* = P(c;\ c,\ k\text{-}t,\ t,\ d)$$

for m where $d = \dfrac{\delta^*\sqrt{m}}{\sigma}$, using interpolation in Table D when necessary.

Solution in terms of the second goal (1.3) may be had by solving

$$(1.7) \qquad P^* = P(c;\ s,\ k\text{-}t,\ t,\ d)$$

for m or for s, according to which variation of the procedure is employed.

2. Rank Order Probabilities for Large D

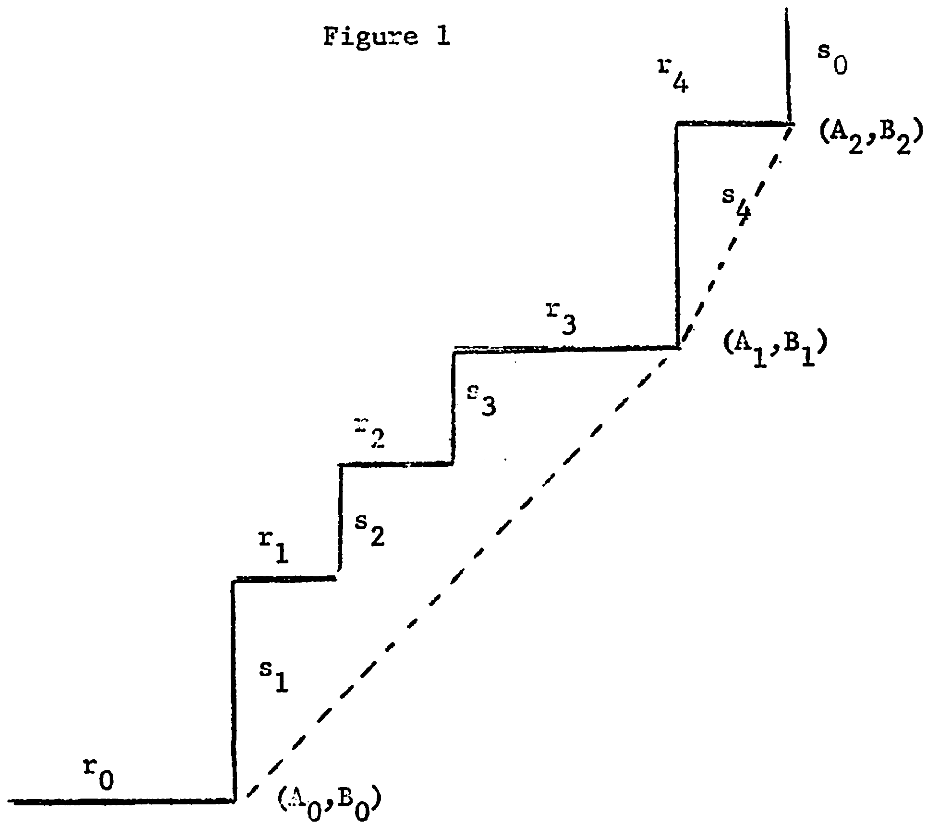
It is clear that $P(z^0 \mid D) \to 1$ as $D \to \infty$ for $z^0 = (0 \ldots 01 \ldots 1)$, and consequently that the probability of all other rank orders tends to zero. Hodges and Lehmann (1962) have presented a method describing this tendency for $z \neq z^0$, as follows.

The rank order $z = (\underbrace{0\ldots0}_{r_0}\underbrace{1\ldots1}_{s_1}\underbrace{0\ldots0}_{r_1}\underbrace{1\ldots1}_{s_2}\underbrace{0\ldots0}_{r_2}\ldots\underbrace{1\ldots1}_{s_c}\underbrace{0\ldots0}_{r_c}\underbrace{1\ldots1}_{s_0})$

is characterized by the number of variables in the successive groups, a set of integers $(r_0, s_1, r_1, \ldots, s_c, r_c, s_0)$ with $\Sigma r_i = m$,

$\Sigma s_j = n$. Here $r_0 = 0$ if $z_1 = 1$ and $s_0 = 0$ if $z_{m+n} = 0$. The graph of a rank order z may be obtained by representing each 0 by a horizontal and each 1 by a vertical unit segment. Figure 1 illustrates the graph for $z = (00110101001101) = (2, 2, 1, 1, 1, 1, 2, 2, 1, 1)$.

Figure 1



The segments r_0 and s_0 are disregarded and the lower convex hull of the graph is formed with k+1 corner points $(A_0, B_0), (A_1, B_1), \ldots, (A_k, B_k)$. In Figure 1, k = 2 and the convex hull represented by the dotted line has three corner points: (2, 0), (6, 4), (7, 6). Hodges and Lehmann prove that, for $z \neq z^0$,

$$(2.1) \qquad \lim_{D \to \infty} [P(z \mid D)]^{1/D^2} = \exp\left[-1/2 \sum_{i=1}^{k} \frac{a_i b_i}{a_i + b_i}\right]$$

where $a_i = A_i - A_{i-1}$ and $b_i = B_i - B_{i-1}$ $(i = 1, \ldots, k)$. In Figure 1, the right-hand side of (2.1) is $e^{-4/3}$.

Table 1 presents the exact values of $P(z \mid D)$ for $z^0 = (0 \ldots 01 \ldots 1)$ and $z^1 = (0 \ldots 0101 \ldots 1)$; $1 \leq n \leq m \leq 7$ and $n = 1$, $m = 8(1)12$; $D = 4, 5, 6$. The table gives an indication of the rate at which $P(z^0 \mid D) \to 1$ and $P(z^1 \mid D) \to 0$. Calculations using Table 1 show that $P(z^1 \mid 6)^{1/36}$ ranges from .7283 to .8089, compared with the Hodges - Lehmann value $e^{-1/4} = .7788$ (which, it is interesting to note, is independent of m and n).

TABLE 1

$P(Z^O|D)$ FOR LARGE D

M	N	Z^O	D = 4.0	D = 5.0	D = 6.0
1	1	01	.99766113	.99979652	.99998895
2	1	001	.99549652	.99959919	.99997803
3	1	0001	.99347006	.99940723	.99996720
2	2	0011	.99133986	.99921066	.99995628
4	1	00001	.99155761	.99922005	.99995649
3	2	00011	.98745787	.99883286	.99993476
5	1	00001	.98974182	.99903719	.99994586
4	2	000011	.98380234	.99846462	.99991344
3	3	000111	.98185533	.99827457	.99990264
6	1	0000001	.98800962	.99885826	.99993533
5	2	0000011	.98033865	.99810499	.99989230
4	3	0000111	.97659023	.99773060	.99987082
7	1	00000001	.98635083	.99868295	.99992488
6	2	00000011	.97704073	.99775323	.99987135
5	3	00000111	.97161075	.99719955	.99983929
4	4	00001111	.96982514	.99701565	.99982861
8	1	000000001	.98475726	.99851099	.99991451
7	2	000000011	.97388823	.99740869	.99985057
6	3	000000111	.96687784	.99668026	.99980802
5	4	000001111	.96343809	.99631791	.99978677
9	1	0000000001	.98322223	.99834214	.99990422
8	2	0000000011	.97086486	.99707083	.99982995
7	3	0000000111	.96236108	.99617180	.99977702
6	4	0000001111	.95737714	.99563584	.99974530
5	5	0000011111	.95573461	.99545774	.99973474
10	1	00000000001	.98174016	.99817620	.99989401
9	2	00000000011	.96795727	.99673919	.99980949
7	4	00000001111	.95160183	.99496817	.99970417
6	5	00000011111	.94843554	.99461715	.99968315
11	1	000000000001	.98030635	.99801300	.99988387
10	2	000000000011	.96515438	.99641337	.99978918
7	5	000000011111	.94149041	.99379454	.99963199
6	6	000000111111	.93997547	.99362192	.99962154
12	1	0000000000001	.97891677	.99785237	.99987379
11	2	0000000000011	.96244679	.99609300	.99976901
7	6	0000000111111	.93193653	.99264824	.99956045
12	2	00000000000011	.95982651	.99577777	.99974898
7	7	00000001111111	.92286990	.99152705	.99948950

TABLE 1 (CONTINUED)

$P(Z^1 | D)$ FOR LARGE D

M	N	Z^1	D = 4.0	D = 5.0	D = 6.0
1	1	10	.00233887	.00020348	.00001105
2	1	010	.00432922	.00039466	.00002186
3	1	0010	.00607938	.00057588	.00003246
2	2	0101	.00797576	.00076486	.00004325
4	1	00010	.00764982	.00074871	.00004288
3	2	00101	.01115405	.00111521	.00006423
5	1	00010	.00907895	.00091431	.00005312
4	2	000101	.01398348	.00144887	.00008483
3	3	001011	.01554262	.00162491	.00009537
6	1	0000010	.01039315	.00107356	.00006321
5	2	0000101	.01653969	.00176816	.00010508
4	3	0001011	.01942203	.00210972	.00012595
7	1	00000010	.01161155	.00122717	.00007314
6	2	00000101	.01887454	.00207485	.00012502
5	3	00001011	.02290414	.00257309	.00015601
4	4	00010111	.02419873	.00273755	.00016632
8	1	000000010	.01274854	.00137571	.00008294
7	2	000000101	.02102549	.00237033	.00014466
6	3	000001011	.02606545	.00301767	.00018559
5	4	000010111	.02846077	.00333694	.00020599
9	1	0000000010	.01381529	.00151965	.00009260
8	2	0000000101	.02302071	.00265573	.00016402
7	3	0000001011	.02896113	.00344556	.00021473
6	4	0000010111	.03230857	.00391144	.00024503
5	5	0000101111	.03339125	.00406546	.00025512
10	1	00000000010	.01482068	.00165938	.00010214
9	2	00000000101	.02488200	.00293202	.00018312
7	4	00000010111	.03581441	.00446382	.00028348
6	5	00000101111	.03781927	.00476302	.00030344
11	1	000000000010	.01577192	.00179526	.00011156
10	2	000000000101	.02662667	.00319997	.00020197
7	5	000000101111	.04183370	.00543312	.00035103
6	6	000001011111	.04274392	.00557768	.00036090
12	1	0000000000010	.01667495	.00192757	.00012088
11	2	0000000000101	.02826871	.00346027	.00022059
7	6	0000001011111	.04718750	.00635958	.00041747
12	2	00000000000101	.02981965	.00371350	.00023898
7	7	00000010111111	.05199646	.00724805	.00048287

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Description of each table is found on the pages in the text as indicated below. Sections within each table are arranged according to increasing values of combined sample size m+n, for $2 \leq m+n \leq 14$.

Table	Description
B-1 through B-8	II-1, 3
B-1	II-4, 5
B-2	II-4, 5
B-3	II-9
B-4	II-9
B-5	II-10, 13
B-6	II-10, 13
B-7	II-14
B-8	II-14
B-9	II-5, 6
B-10	II-5, 6

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
3	1	.25000000	.30408113	.36269560	.42457845
		T	.30449150	.36361864	.42609511
2	2	.16666667	.21449982	.26918351	.32975727
		T	.21464351	.26953440	.33038014
4	1	.20000000	.24963115	.30500135	.36508824
		T	.25032310	.30659396	.36776176
3	2	.20000000	.26093064	.32992304	.40493202
		T	.26248246	.33355963	.41106493
3	2	.10000000	.13715522	.18246273	.23573967
		T	.13764968	.18373401	.23810279
5	1	.16666667	.21227386	.26431674	.32202364
		T	.21313871	.26634481	.32548849
4	2	.13333333	.18352688	.24379506	.31304421
		T	.18473301	.24680609	.31843609
4	2	.06666667	.09596201	.13348103	.17966062
		T	.09669406	.13544603	.18346000
3	3	.20000000	.26923889	.34847726	.43461849
		T	.27168253	.35418233	.44409868
3	3	.10000000	.14354009	.19803289	.26305310
		T	.14434951	.20015750	.26703942
3	3	.05000000	.07478896	.10770305	.14955634
		T	.07524361	.10898187	.15213899
6	1	.14285714	.18497832	.23393612	.28918808
		T	.18594645	.23624214	.29318643
5	2	.19047619	.25574643	.33085021	.41318427
		T	.25900555	.33840256	.42568103
5	2	.09523810	.13673482	.18888197	.25143848
		T	.13783269	.19174898	.25679568
5	2	.04761905	.07124868	.10272598	.14292084
		T	.07209714	.10508679	.14763924
4	3	.20000000	.27422919	.35975222	.45270407
		T	.27786098	.36807910	.46619654
4	3	.05714286	.08818756	.13005634	.18362191
		T	.08879698	.13178295	.18710139
4	3	.02857143	.04572295	.07006039	.10296429
		T	.04618485	.07144500	.10592862
7	1	.25000000	.31011727	.37573900	.44511493
		T	.31169979	.37918801	.45057135

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.48823116	.55203144	.70186270	.82279295	.95637437
.49038893	.55483521	.70599835	.82740912	.95939012
.39480253	.46254547	.63069050	.77491573	.94286569
.39575540	.46387086	.63296654	.77780527	.94517173
.42852600	.49369886	.65286476	.78783898	.94531133
.43240605	.49883389	.66074251	.79690073	.95143652
.48327052	.56190350	.74083046	.87065102	.98101432
.49209458	.57333095	.75653193	.88562196	.98660576
.29619213	.36242771	.54013749	.70716641	.92051393
.29995788	.36785606	.55011471	.72034528	.93109575
.38421340	.44936488	.61355475	.75845157	.93530472
.38932530	.45623488	.62445464	.77133214	.94431785
.38922832	.46952386	.66669899	.82396356	.97163148
.39743953	.48074387	.68409691	.84235014	.97966390
.23432814	.29662075	.47430205	.65376746	.90079395
.24060300	.30596193	.49263260	.67909779	.92186603
.52362304	.61107987	.79802119	.91608846	.99264607
.53691720	.62767933	.81789939	.93158974	.99590951
.33706822	.41750902	.62412482	.79725992	.96662593
.34340772	.42652614	.63938177	.81455945	.97496723
.20057409	.26024891	.43720951	.62357041	.88989100
.20501563	.26711407	.45183760	.64520209	.90979992
.34974515	.41421617	.58099353	.73315697	.92614917
.35572692	.42236119	.59429777	.74925955	.93779281
.49921510	.58493750	.77379569	.89987551	.98959357
.51672004	.60683718	.80048835	.92143065	.99468927
.32311870	.40162190	.60648935	.78270364	.96219527
.33161108	.41367238	.62681649	.80575143	.97335340
.19216342	.25009137	.42386889	.61011394	.88311041
.20019622	.26238445	.44941709	.64690883	.91492479
.54804689	.64038613	.82955401	.93803876	.99635492
.56636393	.66236668	.85263006	.95309947	.99829787
.24868709	.32379285	.53572249	.73427219	.95187804
.25460181	.33274364	.55306579	.75622038	.96420451
.14539961	.19766839	.36566437	.55944910	.86310011
.15077637	.20639037	.38620864	.59213559	.89557396
.51615713	.58662730	.74667863	.86610908	.97686117
.52358377	.59579993	.75826070	.87672539	.98097672

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
6	2	.21428571	.28673146	.36883270	.45712940
		T	.29006014	.37643573	.46947970
6	2	.07142857	.10616315	.15146150	.20774847
		T	.10721653	.15431017	.21324982
6	2	.03571429	.05518162	.08197661	.11725866
		T	.05607058	.08452682	.12250198
5	3	.19642857	.27453128	.36523898	.46395425
		T	.27791252	.37305271	.47662644
5	3	.07142857	.11105070	.16406632	.23084455
		T	.11216717	.16715780	.23688505
5	3	.03571429	.05842612	.09093765	.13491776
		T	.05897716	.09258893	.13842347
5	3	.01785714	.03019552	.04867975	.07495852
		T	.03064967	.05011262	.07817364
4	4	.24285714	.33267618	.43314353	.53795002
		T	.33718101	.44303983	.55312697
4	4	.10000000	.15271391	.22088778	.30341154
		T	.15439095	.22530359	.31156541
4	4	.02857143	.04819218	.07711919	.11731554
		T	.04859831	.07837925	.12007854
4	4	.01428571	.02486926	.04116277	.06490506
		T	.02520858	.04226833	.06746078
7	2	.25000000	.32991054	.41822945	.51062497
		T	.33389279	.42703639	.52444164
7	2	.05555556	.08502411	.12467199	.17542080
		T	.08604505	.12751402	.18106134
7	2	.02777778	.04411074	.06722768	.09847644
		T	.04499754	.06983994	.10398124
6	3	.19047619	.27028476	.36376768	.46590574
		T	.27386573	.37210562	.47946385
6	3	.08333333	.12952728	.19072434	.26668257
		T	.13154874	.19612024	.27679853
6	3	.04761905	.07799793	.12094916	.17794527
		T	.07891281	.12362845	.18346516
6	3	.02380952	.04089251	.06658693	.10299657
		T	.04141183	.06821598	.10660509
5	4	.20634921	.29460859	.39695801	.50678911
		T	.29865287	.40613682	.52121401
5	4	.09523810	.14966185	.22142122	.30931844
		T	.15173010	.22685288	.31924827
5	4	.03174603	.05514336	.09018877	.13921249
		T	.05569493	.09191168	.14298077
5	4	.01587302	.02879235	.04926907	.07970342
		T	.02911559	.05034455	.08221909
5	4	.00793651	.01481297	.02613929	.04370374
		T	.01508419	.02708390	.04602534

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.54728378	.63472019	.81695205	.92721879	.99424338
.56419881	.65532908	.84006531	.94399541	.99725518
.27443110	.34979948	.55669415	.74615836	.95289806
.28342682	.36294126	.58034163	.77444105	.96766953
.16174143	.21549021	.38378931	.57348251	.86705914
.17090392	.22985133	.41517524	.62039669	.90918495
.56466709	.66104273	.85142671	.95183378	.99796816
.58176676	.68129893	.87141610	.96360501	.99907719
.31009222	.39877476	.63097574	.81981105	.97913442
.31996903	.41303760	.65472009	.84440135	.98721534
.19119547	.25938639	.46718908	.68038068	.93731675
.19744954	.26928178	.48828947	.70916279	.95510447
.11045937	.15609400	.31300578	.50829462	.83925962
.11654647	.16635979	.33921357	.55248834	.88576964
.63995538	.73262187	.89858204	.97260671	.99929383
.65921712	.75396457	.91596606	.98074656	.99971977
.39698108	.49643738	.73102208	.89091904	.99239520
.40950194	.51331109	.75400771	.90963661	.99578362
.17001998	.23530126	.44098141	.65973631	.93201156
.17509902	.24356358	.45969667	.68654734	.94978613
.09769854	.14069827	.29308250	.48883124	.83037372
.10267197	.14930078	.31627733	.52970003	.87617395
.60215621	.68806047	.85640843	.94842739	.99676817
.62038702	.70940740	.87786682	.96220755	.99865560
.23725963	.30904394	.51481376	.71359633	.94382950
.24672314	.32320651	.54169722	.74719558	.96249691
.13885665	.18878582	.35105400	.54213099	.85235078
.14869790	.20453783	.38704822	.59776710	.90414290
.57004943	.66920395	.86136067	.95797368	.99854325
.58830394	.69067646	.88175320	.96920298	.99939855
.35507490	.45158599	.69051352	.86565780	.98879063
.37086918	.47325838	.72158106	.89250855	.99443303
.24899681	.33228424	.56716663	.77645437	.97131844
.25848499	.34664615	.59373266	.80652146	.98261021
.15165565	.21305609	.41276282	.63394360	.92316984
.15835077	.22403881	.43805869	.67055892	.94748541
.61589523	.71627571	.89644120	.97418223	.99950932
.63450345	.73706343	.91311754	.98148928	.99979572
.40939965	.51540073	.75899369	.91302545	.99587441
.42438287	.53509120	.78333615	.93014179	.99786446
.20332793	.28181484	.51803344	.74378822	.96634848
.21017329	.29271763	.54053202	.77153443	.97798247
.12217678	.17790925	.37037032	.59763631	.91265994
.12708498	.18634239	.39183280	.63127646	.93760353
.06939151	.10488232	.24152600	.43371037	.80145386
.07416971	.11357945	.26761238	.48345073	.86228265

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	3	.19166667	.27428010	.37122224	.47690135
		T	.27795849	.37974885	.49064899
7	3	.09166667	.14319513	.21112498	.29460052
		T	.14535360	.21686075	.30524813
7	3	.03333333	.05706939	.09222076	.14095990
		T	.05786314	.09465401	.14619376
7	3	.01666667	.02984193	.05051348	.08099153
		T	.03033044	.05210744	.08465399
7	3	.00833333	.01536117	.02682575	.04446886
		T	.01575883	.02818704	.04776204
6	4	.23809524	.33703129	.44864551	.56433867
		T	.34177805	.45904623	.57999957
6	4	.08571429	.13901283	.21105286	.30093341
		T	.14104385	.21652809	.31113976
6	4	.03333333	.05923856	.09854468	.15385045
		T	.05997624	.10084940	.15885490
6	4	.01904762	.03529900	.06129982	.09999153
		T	.03572849	.06273137	.10331847
6	4	.00952381	.01836972	.03327097	.05671160
		T	.01864467	.03424018	.05910298
6	4	.00476190	.00943043	.01757558	.03089671
		T	.00965437	.01840061	.03303185
5	5	.21031746	.30567405	.41628112	.53379902
		T	.31008617	.42623597	.54918480
5	5	.07539683	.12504985	.19372362	.28121100
		T	.12703510	.19914392	.29142496
5	5	.04761905	.08300919	.13501380	.20550792
		T	.08399998	.13796836	.21159683
5	5	.01587302	.03017531	.05363124	.08933519
		T	.03051620	.05479927	.09212021
5	5	.00793651	.01568267	.02903507	.05048395
		T	.01590300	.02983218	.05249851
5	5	.00396825	.00804477	.01531453	.02744193
		T	.00822603	.01599887	.02925343
7	4	.20606061	.30168351	.41317139	.53199201
		T	.30603357	.42303109	.54727228
7	4	.08181818	.13560309	.20940956	.30238446
		T	.13767549	.21506161	.31298026
7	4	.03636364	.06536731	.10952257	.17151451
		T	.06644435	.11282623	.17852036
7	4	.02121212	.03995571	.07015888	.11514031
		T	.04053365	.07207845	.11955614
7	4	.00606061	.01232711	.02345277	.04183349
		T	.01256535	.02433565	.04411503
7	4	.00303030	.00631809	.01234863	.02267924
		T	.00650540	.01307328	.02464107

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.58397261	.68484805	.87500917	.96502488	.99903613
.60225160	.70599524	.89393699	.97460641	.99961435
.39028463	.49266884	.73433519	.89608812	.99343131
.40665835	.51468105	.76364504	.91890591	.99704212
.20429388	.28150302	.51350084	.73685994	.96319345
.21366302	.29623551	.54316288	.77288361	.97818942
.12326818	.17850577	.36861873	.59356225	.90952884
.13029752	.19040212	.39790592	.63817817	.94101480
.07012065	.10541139	.24074999	.43111242	.79821359
.07680054	.11740674	.27565017	.49583120	.87306591
.67456170	.77112166	.92848375	.98542176	.99983629
.69377253	.79137541	.94209002	.99019207	.99994209
.40451852	.51487664	.76712816	.92112750	.99696024
.42011855	.53550827	.79232754	.93797138	.99855466
.22609089	.31378694	.56894160	.79390370	.98060438
.23504949	.32774361	.59532544	.82238373	.98866508
.15360989	.22289381	.45031898	.69102388	.95516483
.16000554	.23363108	.47517955	.72467537	.97121522
.09119533	.13870872	.31622054	.54535289	.89406082
.09609583	.14751573	.34087059	.58688015	.92758450
.05135630	.08092233	.20326640	.38936920	.77555698
.05596335	.08967610	.23198250	.44784432	.85222784
.64821630	.75034588	.92074514	.98378819	.99982470
.66752743	.77111266	.93520809	.98894623	.99993663
.38393943	.49519941	.75521794	.91717294	.99700714
.39968995	.51617204	.78102073	.93427580	.99849735
.29373914	.39580473	.66462990	.86528622	.99234008
.30402494	.41083808	.68822842	.88563171	.99559460
.13984391	.20634066	.43096201	.67609887	.95235319
.14532638	.21574878	.45380214	.70820665	.96846979
.08264280	.12771946	.30067435	.53027082	.88890352
.08686369	.13546172	.32332209	.56979941	.92244607
.04640347	.07424634	.19235802	.37663746	.76825953
.05039410	.08197445	.21876320	.43217128	.84443135
.64779841	.75106529	.92228858	.98451098	.99984330
.66699436	.77168964	.93651215	.98948556	.99994535
.40997628	.52444013	.78184617	.93148242	.99792959
.42616712	.54572098	.80679054	.94691712	.99906354
.25185103	.34804566	.61697084	.83494848	.98865413
.26403331	.36637981	.64798669	.86386510	.99419889
.17712817	.25627142	.50611832	.74920000	.97349847
.18547477	.26995660	.53511870	.78366367	.98478590
.07013570	.11081863	.27367020	.50082539	.87629020
.07501447	.11993510	.30137661	.55049113	.91933637
.03923919	.06413002	.17392025	.35287009	.75212534
.04365068	.07283319	.20479686	.41945331	.84476636

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
6	5	.21428571	.31547367	.43270582	.55606876
		T	.32018249	.44322479	.57202517
6	5	.08874459	.14805742	.22910653	.33012644
		T	.15039354	.23538007	.34163172
6	5	.04112554	.07463766	.12558836	.19654234
		T	.07576214	.12900363	.20366307
6	5	.01515152	.02997005	.05501653	.09398428
		T	.03034534	.05633070	.09715916
6	5	.00865801	.01776314	.03387517	.06020282
		T	.01800602	.03477212	.06249583
6	5	.00432900	.00920239	.01822469	.03370973
		T	.00936646	.01886130	.03542600
7	5	.21590909	.32166728	.44419029	.57217576
		T	.32640120	.45473341	.58799871
7	5	.07449495	.12944987	.20735616	.30745740
		T	.13155338	.21320897	.31850524
7	5	.03661616	.06887500	.11937244	.19128670
		T	.06994125	.12269951	.19836206
7	5	.02398990	.04692894	.08464305	.14119704
		T	.04768591	.08714265	.14684024
7	5	.00883838	.01872235	.03662308	.06633783
		T	.01899943	.03766244	.06901587
7	5	.00252525	.00572074	.01201575	.02346116
		T	.00584860	.01254283	.02496385
6	6	.24242424	.35560395	.48315083	.61232022
		T	.36076561	.49428054	.62843166
6	6	.08982684	.15353472	.24145554	.35100989
		T	.15603811	.24819840	.36327926
6	6	.04653680	.08605209	.14629707	.22953200
		T	.08743428	.15045185	.23800967
6	6	.02056277	.04125129	.07609811	.12950550
		T	.04181485	.07802262	.13398535
6	6	.00757576	.01639925	.03271839	.06033367
		T	.01662835	.03359762	.06264767
6	6	.00432900	.00968650	.02001186	.03827689
		T	.00984292	.02064081	.04001686
7	6	.22261072	.33630299	.46729815	.60181998
		T	.34136227	.47841482	.61807965
7	6	.09032634	.15746594	.25087741	.36722097
		T	.16015915	.25814530	.38035139
7	6	.03671329	.07150328	.12711383	.20707977
		T	.07269212	.13085271	.21500129
7	6	.01748252	.03666343	.07022712	.12327775
		T	.03723962	.07224244	.12804881
7	6	.00699301	.01580685	.03268486	.06201506
		T	.01603675	.03359130	.06444522
7	6	.00407925	.00954764	.02047635	.04035779
		T	.00970406	.02112477	.04219141

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.67401839	.77652908	.93716474	.98919672	.99992979
.69350262	.79673465	.94952654	.99286062	.99997638
.44504817	.56445859	.81831049	.95033531	.99902346
.46213342	.58613665	.84088843	.96220908	.99956508
.28713089	.39326633	.67382254	.87736862	.99457520
.29921794	.41089602	.70052559	.89862083	.99710795
.14986406	.22382439	.47044267	.72468903	.97045840
.15614275	.23455667	.49530753	.75636225	.98174748
.09998828	.15567732	.36332036	.61687038	.93780041
.10480357	.16444921	.38755074	.65460376	.95949199
.05839195	.09499628	.24886767	.47470307	.86627547
.06220781	.10238641	.27312009	.52090709	.90982890
.69276472	.79529605	.94793086	.99224141	.99996661
.71173502	.81446495	.95856540	.99497008	.99998938
.42411271	.54750714	.81371034	.95117465	.99920140
.44088820	.56912989	.83648100	.96280932	.99964720
.28454518	.39478045	.68558158	.88949294	.99617181
.29670726	.41261608	.71212945	.90937100	.99802621
.21862845	.31553697	.60030042	.83565379	.99125537
.22896056	.33173140	.62922489	.86229074	.99534905
.11161469	.17503904	.40695176	.67300383	.96081125
.11723921	.18520730	.43359314	.71052083	.97622647
.04270472	.07268491	.20930213	.42824947	.84482325
.04622184	.07982414	.23517367	.48137010	.89944786
.72991495	.82619564	.96022199	.99480350	.99998411
.74847714	.84415240	.96900914	.99674530	.99999527
.47434366	.59987572	.85134898	.96594852	.99961014
.49222659	.62190685	.87168368	.97481368	.99983917
.33382941	.45246361	.74217628	.92087507	.99813806
.34775412	.47189359	.76722616	.93665079	.99907818
.20407494	.29904454	.58530018	.82803185	.99099026
.21250805	.31259827	.61079332	.85239070	.99483430
.10315599	.16410449	.39254253	.66151209	.95901729
.10811211	.17322765	.41739305	.69759615	.97443739
.06798442	.11249187	.29776131	.55335276	.91997413
.07191505	.12015059	.32220829	.59600291	.94839097
.72499000	.82558822	.96261924	.99562756	.99999063
.74375730	.84362342	.97098698	.99729273	.99999734
.49702071	.62682739	.87423976	.97516584	.99981856
.51585125	.64944829	.89308780	.98218310	.99993139
.31061270	.43141886	.73408264	.92138699	.99846485
.32402126	.45055630	.75935886	.93696989	.99924449
.19910612	.29724054	.59556844	.84260861	.99365112
.20817483	.31185095	.62233444	.86637266	.99645205
.10834051	.17495032	.42354750	.70334315	.97334156
.11359810	.18464438	.44910827	.73746461	.98399874
.07333808	.12331609	.33084897	.60501009	.94676154
.07753639	.13153740	.35646251	.64642380	.96723729

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	7	.22785548	.34815346	.48604729	.62551305
		T	.35339937	.49743661	.64179925
7	7	.08245921	.14898521	.24401186	.36438549
		T	.15163043	.25129202	.37766860
7	7	.04865967	.09431764	.16551245	.26424088
		T	.09598096	.17055888	.27442769
7	7	.01893939	.04077051	.07947720	.14083514
		T	.04145551	.08187521	.14645747
7	7	.00874126	.02020751	.04234255	.08069845
		T	.02051210	.04353172	.08381961
7	7	.00349650	.00864648	.01942814	.03979122
		T	.00878688	.02003421	.04155967

TABLE B-1

POWER OF TWO-SAMPLE WILCOXON TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.75001670	.84816507	.97200042	.99735271	.99999693
.76820080	.86489108	.97864176	.99841195	.99999919
.49969022	.63473838	.88561942	.98011228	.99990586
.51874094	.65740136	.90326938	.98588584	.99996519
.38609466	.52006602	.81463611	.95835906	.99962949
.40231932	.54158407	.83702850	.96841801	.99984280
.22789092	.33856982	.65578645	.88656723	.99734690
.23836266	.35492489	.68222821	.90591276	.99859973
.14044307	.22422071	.51383256	.79239947	.99008539
.14697804	.23574698	.53966089	.81956248	.99423665
.07454900	.12826653	.35382988	.64357796	.96361431
.07868921	.13648155	.37926227	.68225181	.97810358

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
3	2	.20000000	.20779141	.23074858	.26765048
		T	.20801832	.23164801	.26964058
4	2	.13333333	.14066165	.16237316	.19764379
		T	.14103443	.16386536	.20099587
3	3	.20000000	.21039553	.24086475	.28931537
		T	.21079887	.24245507	.29280011
3	3	.10000000	.10692590	.12753479	.16129173
		T	.10717943	.12856370	.16365200
5	2	.19047619	.20046793	.22980646	.27662459
		T	.20100744	.23193240	.28127901
5	2	.09523810	.10187743	.12166246	.15416186
		T	.10234166	.12353964	.15844392
4	3	.22857143	.24141232	.27876939	.33728940
		T	.24216254	.28168217	.34351116
4	3	.05714286	.06279054	.07979248	.10825393
		T	.06307547	.08097417	.11105263
7	1	.25000000	.25696759	.27751287	.31058916
		T	.25735194	.27902173	.31387794
6	2	.14285714	.15222937	.17990295	.22453956
		T	.15278618	.18211903	.22946631
6	2	.07142857	.07737682	.09520518	.12481150
		T	.07788961	.09729926	.12965928
5	3	.25000000	.26444287	.30624039	.37102850
		T	.26567503	.31095090	.38083919
5	3	.07142857	.07916102	.10235340	.14086924
		T	.07950576	.10377355	.14419201
5	3	.03571429	.04024663	.05405567	.07768673
		T	.04054574	.05532182	.08077487
4	4	.20000000	.21459018	.25699244	.32324223
		T	.21547798	.26043124	.33054961
4	4	.05714286	.06423327	.08563356	.12158151
		T	.06449867	.08674257	.12423029
4	4	.02857143	.03265717	.04518500	.06686995
		T	.03288872	.04617928	.06934446
7	2	.22222222	.23390769	.26801924	.32182087
		T	.23501093	.27229793	.33094888
7	2	.05555556	.06087670	.07691493	.10382841
		T	.06140956	.07911150	.10898474

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.31656128	.37497491	.54331879	.70780192	.92052591
.32000708	.38015588	.55320219	.72095621	.93110707
.24509596	.30281746	.47560365	.65397722	.90079632
.25101045	.31189799	.49385204	.67929014	.92186812
.35246136	.42612477	.62576519	.79748973	.96662766
.35840281	.43486038	.64094087	.81477418	.97496879
.20722544	.26385577	.43784911	.62365475	.88989158
.21149914	.27060768	.45244777	.64528144	.90980045
.33795904	.40998603	.60812258	.78294124	.96219728
.34588721	.42163219	.62832819	.80596529	.97335512
.19856368	.25358325	.42450228	.61020039	.88311107
.20626224	.26564714	.44998809	.64698409	.91492533
.41185152	.49622287	.70859580	.86692529	.98638295
.42209059	.51061395	.73004192	.88674886	.99180737
.14813656	.19901486	.36584636	.55946664	.86310017
.15339933	.20766715	.38637685	.59215143	.89557401
.35453670	.40720397	.56038335	.71288467	.91777544
.36012266	.41541969	.57516021	.73154068	.93179788
.28390028	.35489565	.55757194	.74626940	.95289874
.29245507	.36773604	.58113970	.77453856	.96767009
.16586803	.21764565	.38413636	.57352394	.86705937
.17473995	.23181615	.41547631	.62043092	.90918512
.45226821	.54223672	.75726257	.90209567	.99297174
.46786779	.56324352	.78448435	.92308628	.99656829
.19412968	.26075279	.46734550	.68039294	.93731678
.20026257	.27057738	.48843379	.70917381	.95510449
.11177122	.15669090	.31307074	.50829950	.83925963
.11777713	.16691079	.33927123	.55249253	.88576964
.40721779	.50139672	.73163108	.89096817	.99239529
.41913060	.51788864	.75454152	.90967732	.99578369
.17203468	.23619696	.44107133	.65974235	.93201156
.17704166	.24441932	.45978068	.68655287	.94978614
.09860505	.14109268	.29312029	.48883369	.83037373
.10352891	.14966852	.31631143	.52970217	.87617396
.39107846	.47053144	.67720615	.84128788	.98002665
.40609048	.49164565	.70904130	.87161454	.98936018
.14168094	.19020801	.35126127	.54215313	.85235088
.15127518	.20580394	.38722148	.59778448	.90414297

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
6	3	.16666667	.18021161	.21981420	.28241310
		T	.18130284	.22406836	.29154643
6	3	.09523810	.10546743	.13589559	.18560413
		T	.10603109	.13818051	.19081327
6	3	.04761905	.05401281	.07341850	.10635268
		T	.05435649	.07486149	.10982244
6	3	.02380952	.02746025	.03871538	.05839047
		T	.02775722	.03999727	.06160380
5	4	.19047619	.20657737	.25329580	.32601644
		T	.20768798	.25756370	.33496309
5	4	.06349206	.07231583	.09890051	.14335028
		T	.07268401	.10043328	.14698093
5	4	.03174603	.03703121	.05328802	.08154276
		T	.03725864	.05426917	.08399341
5	4	.01587302	.01882511	.02804939	.04455860
		T	.01902220	.02892360	.04683324
7	3	.18333333	.19844926	.24242224	.31122993
		T	.19962155	.24696169	.32086543
7	3	.06666667	.07540999	.10171048	.14557009
		T	.07592784	.10385011	.15058529
7	3	.03333333	.03862594	.05487504	.08302875
		T	.03896304	.05631612	.08658286
7	3	.01666667	.01963615	.02889600	.04541375
		T	.01992073	.03014742	.04863180
6	4	.17142857	.18835147	.23750360	.31411415
		T	.18950796	.24196449	.32350827
6	4	.06666667	.07675521	.10712350	.15775895
		T	.07725312	.10918512	.16259263
6	4	.03809524	.04490985	.06582548	.10197687
		T	.04521556	.06713832	.10522472
6	4	.01904762	.02299661	.03537331	.05760342
		T	.02319994	.03627690	.05995290
6	4	.00952381	.01168840	.01857896	.03131376
		T	.01185841	.01935624	.03341938
5	5	.22222222	.24158665	.29717054	.38183919
		T	.24297750	.30241117	.39247194
5	5	.09523810	.10843155	.14761603	.21129701
		T	.10907464	.15020720	.21712416
5	5	.03174603	.03796420	.05718938	.09084562
		T	.03821271	.05827180	.09357565
5	5	.01587302	.01943766	.03069268	.05116540
		T	.01960384	.03144175	.05315034
5	5	.00793651	.00987867	.01610688	.02776134
		T	.01001862	.01675578	.02955164

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.36307861	.45541315	.69097181	.86569436	.98879070
.37817031	.47664552	.72195237	.89253516	.99443307
.25268763	.33395482	.56734042	.77646633	.97131846
.26197225	.34819989	.59388787	.80653171	.98261022
.15320910	.21373273	.41282728	.63394770	.92316985
.15981793	.22466830	.43811644	.67056247	.94748541
.08755373	.12715713	.27267087	.46631517	.81777278
.09399770	.13846465	.30369138	.52132688	.87861247
.41756968	.51912946	.75937810	.91305064	.99587443
.43186866	.53840627	.78364833	.93016003	.99786448
.20516511	.28257631	.51809526	.74379140	.96634848
.21192814	.29343617	.54058861	.77153725	.97798247
.12296537	.17822550	.37039417	.59763746	.91265994
.12783639	.18664008	.39185459	.63127748	.93760353
.06975056	.10502363	.24153624	.43371085	.80145386
.07450273	.11370812	.26762130	.48345113	.86228265
.39856067	.49652165	.73475766	.89611803	.99343135
.41422687	.51810297	.76398994	.91892800	.99704215
.20639379	.28239867	.51358009	.73686449	.96319345
.21562793	.29705835	.54323233	.77288741	.97818942
.12416205	.17887372	.36864876	.59356386	.90952884
.13112755	.19073712	.39793193	.63817950	.94101480
.07052650	.10557520	.24076280	.43111308	.79821359
.07716356	.11754912	.27566055	.49583170	.87306591
.41061331	.51748801	.76735127	.92113908	.99696025
.42568132	.53781908	.79250773	.93797975	.99855466
.22774470	.31443589	.56898622	.79390556	.98060438
.23660485	.32834348	.59536489	.82238531	.98866508
.15441995	.22320078	.45033845	.69102464	.95516483
.16077226	.23391745	.47519707	.72467603	.97121522
.09154794	.13883847	.31622825	.54535317	.89406082
.09642636	.14763536	.34087741	.58688039	.92758450
.05151815	.08098088	.20326975	.38936932	.77555698
.05611009	.08972792	.23198531	.44784441	.85222784
.48501857	.59458959	.82866919	.95144888	.99888407
.50125735	.61524639	.84996548	.96281598	.99947681
.29619917	.39677024	.66469513	.86528883	.99234008
.30633105	.41172571	.68828531	.88563386	.99559460
.14043872	.20655762	.43097436	.67609929	.95235319
.14589220	.21595252	.45381338	.70820703	.96846979
.08290324	.12781184	.30067930	.53027098	.88890352
.08710910	.13554749	.32332653	.56979955	.92244607
.04652338	.07428819	.19236018	.37663753	.76825953
.05050354	.08201181	.21876503	.43217134	.84443135

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	4	.23030303	.25037106	.30781976	.39486204
		T	.25188853	.31351720	.40635287
7	4	.07272727	.08417698	.11855073	.17552813
		T	.08489629	.12149035	.18227848
7	4	.04242424	.05042917	.07495838	.11717778
		T	.05084267	.07672281	.12149259
7	4	.02424242	.02950848	.04596657	.07532869
		T	.02977465	.04714277	.07835347
7	4	.00606061	.00767746	.01291776	.02290118
		T	.00782434	.01360875	.02484351
6	5	.24675325	.26865221	.33094188	.42411462
		T	.27028664	.33700958	.43612513
6	5	.08225108	.09559028	.13543606	.20080364
		T	.09634175	.13847592	.20766556
6	5	.03030303	.03706159	.05808267	.09520649
		T	.03734199	.05931296	.09833044
6	5	.01731602	.02167659	.03551204	.06083513
		T	.02186373	.03636186	.06310068
6	5	.00865801	.01109520	.01899225	.03399781
		T	.01122480	.01960084	.03569834
6	5	.00432900	.00563711	.00994101	.01834530
		T	.00574187	.01044725	.01981768
7	5	.20202020	.22433704	.28816914	.38460362
		T	.22592787	.29413385	.39657897
7	5	.07323232	.08675945	.12737804	.19456393
		T	.08749784	.13039091	.20143456
7	5	.04797980	.05820596	.08950640	.14311739
		T	.05875319	.09181436	.14864121
7	5	.01767677	.02256567	.03815904	.06690082
		T	.02278252	.03914940	.06955160
7	5	.00505051	.00675168	.01240412	.02359586
		T	.00685609	.01291351	.02508939
7	5	.00252525	.00342925	.00647847	.01267696
		T	.00351025	.00688533	.01391830
6	6	.24025974	.26437075	.33265597	.43386168
		T	.26614365	.33918811	.44661739
6	6	.09307359	.10911876	.15674899	.23385204
		T	.11004820	.16045837	.24203279
6	6	.04112554	.05065040	.08002802	.13100526
		T	.05106937	.08182607	.13540999
6	6	.01515152	.01961651	.03397152	.06078039
		T	.01979829	.03481333	.06307418
6	6	.00865801	.01146830	.02068572	.03851055
		T	.01159502	.02129206	.04023874
6	6	.00432900	.00586718	.01101860	.02134786
		T	.00595598	.01145775	.02265719

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.50009368	.61067867	.84143611	.95725061	.99913210
.51749619	.63257696	.86317621	.96826589	.99963307
.25350114	.34867217	.61700984	.83494992	.98865413
.26553689	.36693395	.64801835	.86386616	.99419889
.17792810	.25656142	.50613437	.74920053	.97349847
.18622092	.27022195	.53513268	.78366411	.98478592
.11962286	.18019000	.39531264	.64400985	.94371248
.12579411	.19104575	.42296754	.68437386	.96499739
.03931966	.06415710	.17392152	.35287013	.75212534
.04372184	.07285641	.20479787	.41945334	.84476636
.53460223	.64774671	.87029132	.96972761	.99959721
.55232325	.66931379	.88937862	.97797406	.99983637
.28882571	.39388499	.67385649	.87736969	.99457520
.30076797	.41144536	.70055324	.89862161	.99710796
.15031242	.22397551	.47044948	.72468920	.97045840
.15656595	.23469712	.49531362	.75636241	.98174748
.10021346	.15575112	.36332349	.61687046	.93780041
.10501569	.16451768	.38755353	.65460382	.95949199
.05849184	.09502822	.24886895	.47470310	.86627547
.06230046	.10241548	.27312120	.52090711	.90982890
.03256154	.05467304	.15692874	.33155579	.73871176
.03601746	.06173307	.18384981	.39298261	.83104742
.50038604	.62046818	.86044986	.96821762	.99962765
.51833730	.64264670	.88053936	.97683735	.99985210
.28576987	.39519758	.68560025	.88949340	.99617181
.29782449	.41298532	.71214458	.90937133	.99802621
.21932151	.31576525	.60030987	.83565401	.99125537
.22959356	.33193395	.62923260	.86229090	.99534905
.11180360	.17509696	.40695377	.67300387	.96081125
.11741584	.18526051	.43359491	.71052086	.97622647
.04274765	.07269746	.20930252	.42824947	.84482325
.04626091	.07983529	.23517400	.48137011	.89944786
.02364888	.04149597	.13048108	.29506986	.71212563
.02670625	.04802994	.15788153	.36214760	.82097846
.55209259	.67056121	.89112084	.97846333	.99982860
.57052921	.69236461	.90837449	.98472785	.99993471
.33545525	.45301992	.74220121	.92087568	.99813806
.34922104	.47237789	.76724564	.93665120	.99907818
.20459633	.29920937	.58530623	.82803197	.99099026
.21299355	.31274857	.61079853	.85239080	.99483430
.10330146	.16414768	.39254391	.66151212	.95901729
.10824877	.17326757	.41739426	.69759617	.97443739
.06805856	.11251336	.29776195	.55335277	.91997413
.07198423	.12017029	.32220886	.59600292	.94839097
.03927323	.06768905	.20020308	.41749467	.84001667
.04240575	.07415569	.22446450	.46869486	.89471040

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	6	.23426573	.26022368	.33349050	.44128596
		T	.26211294	.34041022	.45465342
7	6	.07342657	.08865308	.13438235	.20986842
		T	.08949427	.13780183	.21759264
7	6	.03496503	.04425546	.07322219	.12434879
		T	.04469363	.07512205	.12905467
7	6	.02214452	.02878942	.04995528	.08873741
		T	.02906620	.05120848	.09203233
7	6	.00815851	.01114038	.02104327	.04054134
		T	.01126956	.02167208	.04236537
7	6	.00466200	.00651003	.01277065	.02552159
		T	.00660183	.01323186	.02691731
7	7	.20862471	.23603260	.31348838	.42758450
		T	.23794566	.32051085	.44116836
7	7	.09731935	.11695550	.17497891	.26778968
		T	.11811523	.17956318	.27769478
7	7	.03787879	.04871216	.08247501	.14185151
		T	.04923841	.08474441	.14740425
7	7	.01748252	.02362453	.04354641	.08107980
		T	.02387182	.04469358	.08418036
7	7	.00699301	.00992754	.01985229	.03991782
		T	.01004601	.02044361	.04167961
7	7	.00407925	.00593280	.01233694	.02575391
		T	.00601694	.01277160	.02710867

TABLE B-2

POWER OF TWO-SAMPLE WILCOXON TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.56569201	.68812591	.90590304	.98381838	.99991648
.58469300	.71007395	.92172819	.98878583	.99997009
.31157937	.43172115	.73409309	.92138717	.99846485
.32489085	.45081847	.75936697	.93697002	.99924449
.19945265	.29734181	.59557141	.84260865	.99365112
.20849195	.31194104	.62233687	.86637269	.99645205
.14846533	.23056377	.50842220	.77817765	.98632263
.15524022	.24233194	.53469245	.80721733	.99210110
.07339202	.12333045	.33084930	.60501009	.94676154
.07758658	.13155051	.35646280	.64642381	.96723729
.04792529	.08362646	.24749589	.49897042	.90211892
.05129310	.09058012	.27259454	.54714106	.93832198
.55914488	.68795570	.91178175	.98646153	.99995238
.57841293	.71004061	.92688243	.99071508	.99998364
.38728475	.52042241	.81464668	.95835921	.99962949
.40337429	.54188668	.83703637	.96841810	.99984279
.22819981	.33865384	.65578843	.88656725	.99734690
.23864176	.35499826	.68222977	.90591277	.99859973
.14055145	.22424830	.51383311	.79239947	.99008539
.14707842	.23577196	.53966136	.81956249	.99423665
.07458300	.12827473	.35383003	.64357796	.96361431
.07872081	.13648902	.37926240	.68225181	.97810358
.04996050	.08930542	.27216377	.54535276	.93190580
.05330758	.09632289	.29748001	.59132330	.95840062

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
3	1	.25000000	.30408113	.36269560	.42457845
		T	.30449150	.36361864	.42609511
2	2	.16666667	.21449982	.26918351	.32975727
		T	.21464351	.26953440	.33038014
4	1	.20000000	.24963115	.30500135	.36508824
		T	.25032310	.30659396	.36776176
3	2	.20000000	.26093064	.32992304	.40493202
		T	.26248246	.33355963	.41106493
3	2	.10000000	.13715522	.18246273	.23573967
		T	.13764968	.18373401	.23810279
5	1	.16666667	.21227386	.26431674	.32202364
		T	.21313871	.26634481	.32548849
4	2	.20000000	.26418818	.33711145	.41632503
		T	.26726595	.34429426	.42833009
4	2	.06666667	.09596201	.13348103	.17966062
		T	.09669406	.13544603	.18346000
3	3	.25000000	.32666919	.41100762	.49918048
		T	.33114999	.42109142	.51532481
3	3	.10000000	.14354009	.19803289	.26305310
		T	.14434951	.20015750	.26703942
3	3	.05000000	.07478896	.10770305	.14955634
		T	.07524361	.10898187	.15213899
6	1	.14285714	.18497832	.23393612	.28918808
		T	.18594645	.23624214	.29318643
5	2	.23809524	.31248781	.39523441	.48279148
		T	.31574711	.40249876	.49432614
5	2	.09523810	.13673482	.18888197	.25143848
		T	.13783269	.19174898	.25679568
5	2	.04761905	.07124868	.10272598	.14292084
		T	.07209714	.10508679	.14763924
4	3	.22857143	.30809637	.39758223	.49254490
		T	.31237841	.40718740	.50775554
4	3	.08571429	.12768593	.18176380	.24777409
		T	.12933929	.18620115	.25622813
4	3	.02857143	.04572295	.07006039	.10296429
		T	.04618485	.07144500	.10592862
7	1	.25000000	.31011727	.37573900	.44511493
		T	.31169979	.37918801	.45057135

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.48823116	.55203144	.70186270	.82279295	.95637437
.49038893	.55483521	.70599835	.82740912	.95939012
.39480253	.46254547	.63069050	.77491573	.94286569
.39575540	.46387086	.63296654	.77780527	.94517173
.42852600	.49369886	.65286476	.78783898	.94531133
.43240605	.49883389	.66074251	.79690073	.95143652
.48327052	.56190350	.74083046	.87065102	.98101432
.49209458	.57333095	.75653193	.88562196	.98660576
.29619213	.36242771	.54013749	.70716641	.92051393
.29995788	.36785606	.55011471	.72034528	.93109575
.38421340	.44936488	.61355475	.75845157	.93530472
.38932530	.45623488	.62445464	.77133214	.94431785
.49864904	.58055973	.76250361	.88808730	.98574325
.51568573	.60221910	.79036365	.91230560	.99278551
.23432814	.29662075	.47430205	.65376746	.90079395
.24060300	.30596193	.49263260	.67909779	.92186603
.58685909	.66985969	.83707671	.93498265	.99440704
.60866268	.69607119	.86561145	.95523862	.99801083
.33706822	.41750902	.62412482	.79725992	.96662593
.34340772	.42652614	.63938177	.81455945	.97496723
.20057409	.26024891	.43720951	.62357041	.88989100
.20501563	.26711407	.45183760	.64520209	.90979992
.34974515	.41421617	.58099353	.73315697	.92614917
.35572692	.42236119	.59429777	.74925955	.93779281
.57095812	.65547682	.82906602	.93266662	.99489828
.58642594	.67395670	.84891294	.94654149	.99721078
.32311870	.40162190	.60648935	.78270364	.96219527
.33161108	.41367238	.62681649	.80575143	.97335340
.19216342	.25009137	.42386889	.61011394	.88311041
.20019622	.26238445	.44941709	.64690883	.91492479
.58762857	.67750452	.85421214	.94962780	.99730740
.60778951	.70110330	.87741136	.96375607	.99890013
.32418472	.40814978	.62502135	.80420989	.97061997
.33774454	.42747429	.65698419	.83837373	.98401739
.14539961	.19766839	.36566437	.55944910	.86310011
.15077637	.20639037	.38620864	.59213559	.89557396
.51615713	.58662730	.74667863	.86610908	.97686117
.52358377	.59579993	.75826070	.87672539	.98097672

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
6	2	.25000000	.32881559	.41592294	.50719288
		T	.33203507	.42302560	.51831871
6	2	.07142857	.10616315	.15146150	.20774847
		T	.10721653	.15431017	.21324982
6	2	.03571429	.05518162	.08197661	.11725866
		T	.05607058	.08452682	.12250198
5	3	.23214286	.31733818	.41322538	.51428577
		T	.32125271	.42204491	.52821880
5	3	.08928571	.13588961	.19658449	.27094788
		T	.13752068	.20092981	.27910487
5	3	.03571429	.05842612	.09093765	.13491776
		T	.05897716	.09258893	.13842347
5	3	.01785714	.03019552	.04867975	.07495852
		T	.03064967	.05011262	.07817364
4	4	.24285714	.33267618	.43314353	.53795002
		T	.33718101	.44303983	.55312697
4	4	.10000000	.15271391	.22088778	.30341154
		T	.15439095	.22530359	.31156541
4	4	.02857143	.04819218	.07711919	.11731554
		T	.04859831	.07837925	.12007854
4	4	.01428571	.02486926	.04116277	.06490506
		T	.02520858	.04226833	.06746078
7	2	.25000000	.33034159	.41918880	.51215450
		T	.33389279	.42703639	.52444164
7	2	.08333333	.12351607	.17535880	.23888688
		T	.12502192	.17937016	.24649215
7	2	.02777778	.04411074	.06722768	.09847644
		T	.04499754	.06983994	.10398124
6	3	.22619048	.31386966	.41330825	.51837726
		T	.31759811	.42173243	.53165694
6	3	.09523810	.14615247	.21234791	.29289662
		T	.14837957	.21829883	.30404527
6	3	.04761905	.07799793	.12094916	.17794527
		T	.07891281	.12362845	.18346516
6	3	.02380952	.04089251	.06658693	.10299657
		T	.04141183	.06821598	.10660509
5	4	.23809524	.33324793	.44037142	.55183828
		T	.33730756	.44936647	.56562169
5	4	.09523810	.14976646	.22158022	.30939937
		T	.15173010	.22685288	.31924827
5	4	.04761905	.07998673	.12643057	.18854009
		T	.08096752	.12935527	.19463414
5	4	.02380952	.04199882	.06982756	.10967862
		T	.04260370	.07177144	.11406175
5	4	.00793651	.01481297	.02613929	.04370374
		T	.01508419	.02708390	.04602534

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.59788399	.68337346	.85258181	.94665837	.99678993
.61255331	.70054819	.86986689	.95775845	.99826838
.27443110	.34979948	.55669415	.74615836	.95289806
.28342682	.36294126	.58034163	.77444105	.96766953
.16174143	.21549021	.38378931	.57348251	.86705914
.17090392	.22985133	.41517524	.62039669	.90918495
.61408413	.70648273	.87917660	.96322050	.99857418
.63238441	.72757033	.89856425	.97386295	.99947050
.35672704	.44996174	.68152726	.85552398	.98626274
.36952153	.46765787	.70778278	.87948506	.99215255
.19119547	.25938639	.46718908	.68038068	.93731675
.19744954	.26928178	.48828947	.70916279	.95510447
.11045937	.15609400	.31300578	.50829462	.83925962
.11654647	.16635979	.33921357	.55248834	.88576964
.63995538	.73262187	.89858204	.97260671	.99929383
.65921712	.75396457	.91596606	.98074656	.99971977
.39698108	.49643738	.73102208	.89091904	.99239520
.40950194	.51331109	.75400771	.90963661	.99578362
.17001998	.23530126	.44098141	.65973631	.93201156
.17509902	.24356358	.45969667	.68654734	.94978613
.09769854	.14069827	.29308250	.48883124	.83037372
.10267197	.14930078	.31627733	.52970003	.87617395
.60422799	.69057630	.85930129	.95067378	.99726922
.62038702	.70940740	.87786682	.96220755	.99865560
.31287296	.39482141	.61018382	.79307769	.96854551
.32504072	.41215498	.63904102	.82435365	.98121115
.13885665	.18878582	.35105400	.54213099	.85235078
.14869790	.20453783	.38704822	.59776710	.90414290
.62186342	.71693178	.89014812	.96937906	.99907699
.63918132	.73664741	.90736406	.97809753	.99965971
.38471684	.48287239	.71712195	.88058089	.99016285
.40208369	.50661398	.75066536	.90901238	.99592019
.24899681	.33228424	.56716663	.77645437	.97131844
.25848499	.34664615	.59373266	.80652146	.98261021
.15165565	.21305609	.41276282	.63394360	.92316984
.15835077	.22403881	.43805869	.67055892	.94748541
.65909182	.75457239	.91663808	.98080657	.99969067
.67640807	.77338993	.93066232	.98648379	.99987898
.40920431	.51471985	.75674336	.91023985	.99506754
.42438287	.53509120	.78333615	.93014179	.99786446
.26603404	.35634917	.60429411	.81128358	.98048072
.27655867	.37225267	.63281032	.84148241	.98960707
.16316375	.23053711	.44573257	.67285833	.94082945
.17139051	.24410692	.47663707	.71566723	.96489533
.06939151	.10488232	.24152600	.43371037	.80145386
.07416971	.11357945	.26761238	.48345073	.86228265

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	3	.23333333	.32485530	.42818408	.53645875
		T	.32889201	.43719609	.55043672
7	3	.10000000	.15500252	.22670002	.31375060
		T	.15709613	.23220350	.32384013
7	3	.05000000	.08293376	.12973872	.19187571
		T	.08400050	.13287239	.19832102
7	3	.02500000	.04358386	.07176827	.11185932
		T	.04431020	.07406102	.11694606
7	3	.00833333	.01536117	.02682575	.04446886
		T	.01575883	.02818704	.04776204
6	4	.24761905	.34880987	.46190602	.57794687
		T	.35317631	.47147597	.59235047
6	4	.09523810	.15273564	.22921787	.32304177
		T	.15487261	.23495558	.33368054
6	4	.04761905	.08207663	.13234752	.20021974
		T	.08310163	.13541214	.20657313
6	4	.02380952	.04336429	.07399197	.11857292
		T	.04396282	.07593208	.12295170
6	4	.00952381	.01836972	.03327097	.05671160
		T	.01864467	.03424018	.05910298
6	4	.00476190	.00943043	.01757558	.03089671
		T	.00965437	.01840061	.03303185
5	5	.24603175	.34920607	.46477213	.58318770
		T	.35362085	.47442866	.59763621
5	5	.09523810	.15406572	.23254942	.32877540
		T	.15631729	.23868454	.34029233
5	5	.04761905	.08300919	.13501380	.20550792
		T	.08399998	.13796836	.21159683
5	5	.01984127	.03704921	.06464770	.10568701
		T	.03756892	.06639740	.10978233
5	5	.00793651	.01568267	.02903507	.05048395
		T	.01590300	.02983218	.05249851
5	5	.00396825	.00804477	.01531453	.02744193
		T	.00822603	.01599887	.02925343
7	4	.24848485	.35358309	.47110418	.59103163
		T	.35780113	.48027831	.60464808
7	4	.10000000	.16209615	.24474163	.34554230
		T	.16430445	.25062940	.35631581
7	4	.04848485	.08505786	.13890355	.21182437
		T	.08623874	.14246719	.21923844
7	4	.02424242	.04517250	.07845943	.12736366
		T	.04584226	.08064066	.13227844
7	4	.00909091	.01806138	.03352626	.05828541
		T	.01841076	.03478560	.06144486
7	4	.00303030	.00631809	.01234863	.02267924
		T	.00650540	.01307328	.02464107

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.64181108	.73704783	.90443949	.97567203	.99942330
.65967110	.75688595	.92043543	.98297188	.99980095
.41226076	.51624082	.75546146	.90899737	.99519033
.42755685	.53647584	.78110666	.92770000	.99760267
.26900258	.35859697	.60422158	.81011327	.98024187
.28001059	.37507421	.63325403	.84052293	.98929687
.16540668	.23264218	.44692252	.67334755	.94138980
.17481505	.24795561	.48081265	.71916538	.96599238
.07012065	.10541139	.24074999	.43111242	.79821359
.07680054	.11740674	.27565017	.49583120	.87306591
.68730549	.78202254	.93347154	.98673491	.99985336
.70495572	.80060285	.94589145	.99106907	.99995031
.42928032	.54042125	.78651730	.93012489	.99743902
.44543487	.56162210	.81180605	.94655377	.99890334
.28510662	.38355778	.64638266	.84978067	.98955023
.29593920	.39959157	.67275081	.87413151	.99435933
.17895145	.25513567	.49420104	.73111298	.96656238
.18711471	.26840665	.52236290	.76569656	.97970686
.09119533	.13870872	.31622054	.54535289	.89406082
.09609583	.14751573	.34087059	.58688015	.92758450
.05135630	.08092233	.20326640	.38936920	.77555698
.05596335	.08967610	.23198250	.44784432	.85222784
.69423729	.78960296	.93875365	.98862516	.99989947
.71176981	.80780751	.95030828	.99235774	.99996556
.43731214	.55007151	.79528349	.93381573	.99720536
.45498182	.57346507	.82372166	.95276438	.99918987
.29373914	.39580473	.66462990	.86528622	.99234008
.30402494	.41083808	.68822842	.88563171	.99559460
.16234702	.23508519	.46951573	.70941893	.95957792
.17025345	.24837916	.50007192	.74991014	.97757521
.08264280	.12771946	.30067435	.53027082	.88890352
.08686369	.13546172	.32332209	.56979941	.92244607
.04640347	.07424634	.19235802	.37663746	.76825953
.05039410	.08197445	.21876320	.43217128	.84443135
.70276468	.79784833	.94351905	.99012340	.99992804
.71911450	.81460475	.95369515	.99321336	.99997337
.45829709	.57407008	.81843770	.94754659	.99863396
.47434157	.59459461	.84080225	.96035008	.99945213
.30275496	.40727901	.67793507	.87364181	.99271623
.31536899	.42580641	.70713798	.89873530	.99678524
.19381159	.27740941	.53400701	.77323145	.97917520
.20290017	.29197061	.56295617	.80518139	.98782658
.09515321	.14629571	.33695626	.57662565	.91347478
.10169944	.15812436	.36971644	.62945456	.94928558
.03923919	.06413002	.17392025	.35287009	.75212534
.04365068	.07283319	.20479686	.41945331	.84476636

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
6	5	.24891775	.35805363	.48011389	.60389626
		T	.36245414	.48964791	.61789817
6	5	.09740260	.16089413	.24634565	.35111892
		T	.16317002	.25245727	.36231104
6	5	.04978355	.08879019	.14666932	.22518496
		T	.08999219	.15030502	.23271806
6	5	.02380952	.04547515	.08051706	.13254724
		T	.04604908	.08243406	.13695414
6	5	.00865801	.01776314	.03387517	.06020282
		T	.01800602	.03477212	.06249583
6	5	.00432900	.00920239	.01822469	.03370973
		T	.00936646	.01886130	.03542600
7	5	.25000000	.36376227	.49091364	.61882039
		T	.36810457	.50028021	.63241272
7	5	.09848485	.16554786	.25644147	.36782121
		T	.16782352	.26252485	.37882406
7	5	.04924242	.08995746	.15129298	.23515386
		T	.09120567	.15507465	.24294241
7	5	.02398990	.04703743	.08496498	.14184692
		T	.04768591	.08714265	.14684024
7	5	.00883838	.01872235	.03662308	.06633783
		T	.01899943	.03766244	.06901587
7	5	.00378788	.00840013	.01724941	.03288763
		T	.00858419	.01798970	.03494319
6	6	.25000000	.36553653	.49468533	.62422128
		T	.36991110	.50410071	.63781111
6	6	.09523810	.16188555	.25296886	.36521433
		T	.16415920	.25911790	.37643633
6	6	.04545455	.08441348	.14403076	.22666061
		T	.08561787	.14770567	.23426821
6	6	.02380952	.04713981	.08579262	.14401001
		T	.04779414	.08799560	.14906043
6	6	.00865801	.01854790	.03661156	.06678061
		T	.01883084	.03768437	.06956825
6	6	.00432900	.00968650	.02001186	.03827689
		T	.00984292	.02064081	.04001686
7	6	.24883450	.36920733	.50393665	.63805051
		T	.37353939	.51322057	.65127100
7	6	.09848485	.17012752	.26832676	.38860549
		T	.17251203	.27474336	.40014691
7	6	.04778555	.09056005	.15648818	.24767126
		T	.09186276	.16049591	.25595495
7	6	.02389277	.04874984	.09073123	.15461144
		T	.04943389	.09306901	.16000460
7	6	.00932401	.02062225	.04168419	.07725064
		T	.02092783	.04286306	.08033908
7	6	.00466200	.01080618	.02294372	.04475594
		T	.01099459	.02371646	.04691662

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.71776607	.81283488	.95211906	.99260923	.99996208
.73429148	.82937175	.96131234	.99506459	.99998712
.46825046	.58775694	.83387144	.95614949	.99917193
.48482543	.60870656	.85539677	.96728116	.99966623
.32266262	.43354762	.71120293	.89745535	.99566628
.33534579	.45186632	.73813987	.91823387	.99811172
.20355446	.29273975	.56144613	.79947838	.98419597
.21182676	.30612745	.58820547	.82845688	.99146521
.09998828	.15567732	.36332036	.61687038	.93780041
.10480357	.16444921	.38755074	.65460376	.95949199
.05839195	.09499628	.24886767	.47470307	.86627547
.06220781	.10238641	.27312009	.52090709	.90982890
.73467340	.82920643	.96062480	.99475581	.99998227
.75040544	.84452959	.96833151	.99653497	.99999424
.49130603	.61527052	.85894223	.96785895	.99962146
.50727177	.63488416	.87705102	.97584441	.99984046
.33931818	.45698315	.74246023	.91900323	.99775811
.35225216	.47526449	.76704680	.93546722	.99899131
.21968567	.31699699	.60208588	.83655498	.99108916
.22896056	.33173140	.62922489	.86229074	.99534905
.11161469	.17503904	.40695176	.67300383	.96081125
.11723921	.18520730	.43359314	.71052083	.97622647
.05838925	.09683984	.26066508	.49875093	.88606441
.06306619	.10605070	.29134442	.55592334	.93292515
.74085127	.83516398	.96357647	.99543988	.99998735
.75644602	.85017514	.97080194	.99700231	.99999586
.49004726	.61545124	.86090163	.96897534	.99965154
.50643615	.63566513	.87956526	.97710599	.99986489
.33048679	.44887778	.73913577	.91925663	.99802245
.34315848	.46680238	.76302804	.93481846	.99902512
.22382018	.32353264	.61345497	.84669603	.99274520
.23317320	.33830495	.63992771	.87064094	.99609004
.11292739	.17768071	.41388110	.68171477	.96346945
.11881832	.18837308	.44192171	.72078297	.97878798
.06798442	.11249187	.29776131	.55335276	.91997413
.07191505	.12015059	.32220829	.59600291	.94839097
.75683216	.85048133	.97072670	.99692561	.99999494
.77166265	.86430850	.97662883	.99799381	.99999837
.52035655	.64953149	.88717707	.97886715	.99986077
.53681098	.66915450	.90314488	.98463649	.99994753
.36095142	.48750256	.78040607	.94147920	.99905910
.37459578	.50640777	.80338486	.95439739	.99959982
.24229032	.35098156	.65545318	.87882554	.99589123
.25225456	.36654934	.68164757	.90005168	.99807415
.13173880	.20759503	.47335388	.74650022	.97996009
.13825958	.21931346	.50218174	.78220246	.98960094
.08047801	.13389045	.34996526	.62529492	.95201890
.08536667	.14334433	.37843300	.66963260	.97228033

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	7	.24883450	.37485878	.51586205	.65473550
		T	.37917985	.52506265	.66761498
7	7	.09848485	.17401836	.27850732	.40635731
		T	.17644565	.28503999	.41798647
7	7	.04982517	.09661261	.16938466	.26989654
		T	.09799132	.17361858	.27853804
7	7	.02476690	.05200369	.09875083	.17030547
		T	.05275675	.10133534	.17622966
7	7	.00990676	.02266139	.04694890	.08841331
		T	.02300515	.04829484	.09195494
7	7	.00495338	.01195670	.02619150	.05223704
		T	.01214692	.02699192	.05451005

TABLE B-3

POWER OF TWO-SAMPLE C1 TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.77518624	.86723417	.97747271	.99807404	.99999826
.78923878	.87984289	.98214137	.99876050	.99999946
.54482529	.67767766	.90794605	.98563843	.99994521
.56106251	.69644360	.92143242	.98967327	.99998022
.39329206	.52808238	.82060577	.96038560	.99965044
.40719497	.54669257	.84037184	.96943331	.99985235
.26809780	.38757684	.70529973	.91204426	.99832642
.27885664	.40392020	.72970793	.92835666	.99920379
.15197775	.23962026	.53310237	.80383940	.98975989
.15941058	.25276160	.56279539	.83563967	.99532579
.09520976	.15925929	.40929295	.69838386	.97380201
.10038068	.16921408	.43769394	.73791943	.98629527

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
3	2	.20000000	.20779141	.23074858	.26765048
		T	.20801832	.23164801	.26964058
4	2	.13333333	.14066165	.16237316	.19764379
		T	.14103443	.16386536	.20099587
3	3	.20000000	.21039553	.24086475	.28931537
		T	.21079887	.24245507	.29280011
3	3	.10000000	.10692590	.12753479	.16129173
		T	.10717943	.12856370	.16365200
5	2	.19047619	.20046793	.22980646	.27662459
		T	.20100744	.23193240	.28127901
5	2	.09523810	.10187743	.12166246	.15416186
		T	.10234166	.12353964	.15844392
4	3	.22857143	.24141232	.27876939	.33728940
		T	.24216254	.28168217	.34351116
4	3	.05714286	.06279054	.07979248	.10825393
		T	.06307547	.08097417	.11105263
7	1	.25000000	.25696759	.27751287	.31058916
		T	.25735194	.27902173	.31387794
6	2	.21428571	.22538572	.25784013	.30919505
		T	.22623120	.26114417	.31633080
6	2	.07142857	.07737682	.09520518	.12481150
		T	.07788961	.09729926	.12965928
5	3	.25000000	.26444287	.30624039	.37102850
		T	.26567503	.31095090	.38083919
5	3	.07142857	.07916102	.10235340	.14086924
		T	.07950576	.10377355	.14419201
5	3	.03571429	.04024663	.05405567	.07768673
		T	.04054574	.05532182	.08077487
4	4	.22857143	.24372595	.28758249	.35554702
		T	.24482723	.29181371	.36442409
4	4	.05714286	.06423327	.08563356	.12158151
		T	.06449867	.08674257	.12423029
4	4	.02857143	.03265717	.04518500	.06686995
		T	.03288872	.04617928	.06934446
7	2	.22222222	.23390769	.26801924	.32182087
		T	.23501093	.27229794	.33094888
7	2	.05555556	.06087670	.07691493	.10382841
		T	.06140956	.07911150	.10898474

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.31656128	.37497491	.54331879	.70780192	.92052591
.32000708	.38015588	.55320219	.72095621	.93110707
.24509596	.30281746	.47560365	.65397722	.90079632
.25101045	.31189799	.49385204	.67929014	.92186812
.35246136	.42612477	.62576519	.79748973	.96662766
.35840281	.43486038	.64094087	.81477418	.97496879
.20722544	.26385577	.43784911	.62365475	.88989158
.21149914	.27060768	.45244777	.64528144	.90980045
.33795904	.40998603	.60812258	.78294124	.96219728
.34588721	.42163219	.62832819	.80596529	.97335512
.19856368	.25358325	.42450228	.61020039	.88311107
.20626224	.26564714	.44998809	.64698409	.91492533
.41185152	.49622287	.70859580	.86692529	.98638295
.42209059	.51061395	.73004192	.88674886	.99180737
.14813656	.19901486	.36584636	.55946664	.86310017
.15339933	.20766715	.38637685	.59215143	.89557401
.35453670	.40720397	.56038335	.71288467	.91777544
.36012266	.41541969	.57516021	.73154068	.93179788
.37563546	.45238488	.65554795	.82269886	.97448058
.38756574	.46950578	.68305098	.85102914	.98503538
.16586803	.21764565	.38413636	.57352394	.86705937
.17473995	.23181615	.41547631	.62043092	.90918512
.45226821	.54223672	.75726257	.90209567	.99297174
.46786779	.56324352	.78448435	.92308628	.99656829
.19412968	.26075279	.46734550	.68039294	.93731678
.20026257	.27057738	.48843379	.70917382	.95510449
.11177122	.15669090	.31307074	.50829950	.83925963
.11777713	.16691079	.33927123	.55249253	.88576964
.44070255	.53483872	.75823064	.90568721	.99392207
.45493607	.55416213	.78358398	.92511929	.99701927
.17203468	.23619696	.44107133	.65974235	.93201156
.17704166	.24441932	.45978068	.68655287	.94978614
.09860505	.14109268	.29312029	.48883369	.83037373
.10352891	.14966852	.31631143	.52970217	.87617396
.39107846	.47053144	.67720615	.84128788	.98002665
.40609048	.49164565	.70904130	.87161454	.98936018
.14168094	.19020801	.35126127	.54215313	.85235088
.15127518	.20580394	.38722148	.59778448	.90414297

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
6	3	.23809524	.25376225	.29902026	.36890220
		T	.25486113	.30322296	.37765425
6	3	.09523810	.10546743	.13589559	.18560413
		T	.10603109	.13818051	.19081327
6	3	.04761905	.05401281	.07341850	.10635268
		T	.05435649	.07486149	.10982244
6	3	.02380952	.02746025	.03871538	.05839047
		T	.02775722	.03999727	.06160380
5	4	.22222222	.23915886	.28801674	.36322346
		T	.24043630	.29289118	.37332763
5	4	.09523810	.10660303	.14036980	.19536773
		T	.10722815	.14291043	.20117285
5	4	.04761905	.05469451	.07618268	.11265986
		T	.05510830	.07793292	.11690580
5	4	.01587302	.01882511	.02804939	.04455860
		T	.01902220	.02892360	.04683324
7	3	.23333333	.24995039	.29787475	.37161888
		T	.25106065	.30211056	.38040033
7	3	.10000000	.11130466	.14486163	.19943611
		T	.11197012	.14755239	.20553993
7	3	.05000000	.05710304	.07864858	.11514963
		T	.05759014	.08069300	.12005569
7	3	.01666667	.01963615	.02889600	.04541375
		T	.01992073	.03014742	.04863180
6	4	.24761905	.26678097	.32161211	.40465881
		T	.26817892	.32688613	.41538613
6	4	.09523810	.10785863	.14534554	.20630986
		T	.10852224	.14802973	.21238631
6	4	.04761905	.05558428	.07984283	.12118151
		T	.05600113	.08160446	.12543864
6	4	.01904762	.02299661	.03537331	.05760342
		T	.02319994	.03627690	.05995290
6	4	.00952381	.01168840	.01857896	.03131376
		T	.01185841	.01935624	.03341938
5	5	.23809524	.25787030	.31444381	.40007268
		T	.25927901	.31975014	.41083273
5	5	.09523810	.10843155	.14761603	.21129701
		T	.10907464	.15020720	.21712416
5	5	.03968254	.04695548	.06924907	.10767163
		T	.04732970	.07086193	.11167781
5	5	.01587302	.01943766	.03069268	.05116540
		T	.01960384	.03144175	.05315034
5	5	.00793651	.00987867	.01610688	.02776134
		T	.01001862	.01675578	.02955164

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.45597801	.55151939	.77418728	.91593532	.99530007
.46987148	.57015007	.79767635	.93302631	.99766442
.25268763	.33395482	.56734042	.77646633	.97131846
.26197225	.34819989	.59388787	.80653171	.98261022
.15320910	.21373273	.41282728	.63394770	.92316985
.15981793	.22466830	.43811644	.67056247	.94748541
.08755373	.12715713	.27267087	.46631517	.81777278
.09399770	.13846465	.30369138	.52132688	.87861247
.45642960	.55784281	.78857504	.92742719	.99685971
.47234351	.57892624	.81377544	.94416978	.99858603
.26915684	.35768097	.60440964	.81128989	.98048072
.27950211	.37348762	.63291306	.84148779	.98960708
.16447229	.23107372	.44577513	.67286048	.94082945
.17261859	.24460236	.47667482	.71566907	.96489533
.06975056	.10502363	.24153624	.43371085	.80145386
.07450273	.11370812	.26762130	.48345113	.86228265
.46299252	.56243035	.78915397	.92663801	.99666765
.47683519	.58080770	.81139870	.94179568	.99837726
.27254230	.36014702	.60436730	.81012209	.98024188
.28333245	.37650302	.63338226	.84053033	.98929688
.16688313	.23326304	.44697570	.67335051	.94138980
.17618240	.24851883	.48085843	.71916780	.96599238
.07052650	.10557520	.24076280	.43111308	.79821359
.07716356	.11754912	.27566055	.49583170	.87306591
.50512025	.61096968	.83469925	.95171534	.99859535
.52157335	.63203733	.85709315	.96439964	.99947482
.28775404	.38462391	.64646052	.84978411	.98955023
.29842149	.40057270	.67281902	.87413437	.99435933
.18003267	.25555167	.49422838	.73111408	.96656238
.18812779	.26878959	.52238696	.76569749	.97970686
.09154794	.13883847	.31622825	.54535317	.89406082
.09642636	.14763536	.34087741	.58688039	.92758450
.05151815	.08098088	.20326975	.38936932	.77555698
.05611009	.08972792	.23198530	.44784441	.85222784
.50349983	.61215982	.83958508	.95538158	.99896825
.51991915	.63302258	.86101514	.96678853	.99957331
.29619917	.39677024	.66469513	.86528883	.99234008
.30633105	.41172571	.68828531	.88563386	.99559460
.16314050	.23537881	.46953300	.70941953	.95957792
.17099931	.24865080	.50008729	.74991067	.97757521
.08290324	.12781184	.30067930	.53027098	.88890352
.08710910	.13554749	.32332653	.56979955	.92244607
.04652338	.07428819	.19236018	.37663753	.76825953
.05050354	.08201181	.21876503	.43217134	.84443135

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	4	.24848485	.26903556	.32763422	.41575007
		T	.27050739	.33316338	.42691129
7	4	.09696970	.11071460	.15147754	.21751981
		T	.11149389	.15462961	.22464393
7	4	.04848485	.05727076	.08406213	.12976679
		T	.05774290	.08605376	.13455612
7	4	.02424242	.02950848	.04596657	.07532869
		T	.02977465	.04714277	.07835347
7	4	.00606061	.00767746	.01291776	.02290118
		T	.00782434	.01360875	.02484351
6	5	.24675325	.26880904	.33150689	.42518072
		T	.27028664	.33700958	.43612513
6	5	.09956710	.11456456	.15895900	.23056972
		T	.11536743	.16219444	.23782866
6	5	.04761905	.05700152	.08566466	.13466368
		T	.05741706	.08743593	.13897862
6	5	.01731602	.02167659	.03551204	.06083513
		T	.02186373	.03636186	.06310068
6	5	.00865801	.01109520	.01899225	.03399781
		T	.01122480	.01960084	.03569834
6	5	.00432900	.00563711	.00994101	.01834530
		T	.00574187	.01044725	.01981768
7	5	.25000000	.27390741	.34154189	.44159313
		T	.27541683	.34711570	.45251961
7	5	.09848485	.11469253	.16266293	.23992533
		T	.11553685	.16604916	.24745137
7	5	.04797980	.05827764	.08979129	.14374193
		T	.05875319	.09181436	.14864121
7	5	.01767677	.02256567	.03815904	.06690082
		T	.02278252	.03914940	.06955160
7	5	.00757576	.00997782	.01785497	.03310137
		T	.01012659	.01856813	.03514260
7	5	.00252525	.00342925	.00647847	.01267696
		T	.00351025	.00688533	.01391830
6	6	.24242424	.26680340	.33575746	.43769738
		T	.26836596	.34153796	.44905503
6	6	.09090909	.10682890	.15412643	.23080386
		T	.10765118	.15743187	.23816955
6	6	.04761905	.05816216	.09045765	.14581105
		T	.05864432	.09250836	.15077008
6	6	.02164502	.02753815	.04620373	.08016088
		T	.02780339	.04740982	.08336557
6	6	.00865801	.01146830	.02068572	.03851055
		T	.01159502	.02129206	.04023874
6	6	.00432900	.00586718	.01101860	.02134786
		T	.00595598	.01145775	.02265719

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.52115820	.63051166	.85316136	.96102316	.99911425
.53808139	.65183951	.87448465	.97203247	.99970692
.30513500	.40819513	.67799334	.87364397	.99271623
.31758270	.42664064	.70718815	.89873706	.99678524
.19476465	.27775836	.53402679	.77323211	.97917520
.20378544	.29228802	.56297321	.80518193	.98782658
.11962286	.18019000	.39531264	.64400985	.94371248
.12579411	.19104575	.42296754	.68437386	.96499739
.03931966	.06415710	.17392152	.35287013	.75212534
.04372184	.07285641	.20479787	.41945333	.84476636
.53607874	.64941147	.87144979	.97008926	.99959860
.55232325	.66931379	.88937862	.97797406	.99983637
.32482640	.43434367	.71124693	.89745671	.99566628
.33735767	.45259060	.73817765	.91823497	.99811172
.20435412	.29301696	.56145946	.79947875	.98419597
.21257931	.30638400	.58821729	.82845719	.99146521
.10021346	.15575112	.36332349	.61687046	.93780041
.10501569	.16451768	.38755353	.65460382	.95949199
.05849184	.09502822	.24886895	.47470310	.86627547
.06230046	.10241548	.27312120	.52090711	.90982890
.03256154	.05467304	.15692874	.33155579	.73871176
.03601746	.06173307	.18384981	.39298261	.83104742
.55821820	.67485141	.89179439	.97820312	.99980987
.57410017	.69377613	.90719828	.98404201	.99992394
.34114255	.45761758	.74248983	.91900397	.99775811
.35393658	.47583574	.76707166	.93546779	.99899131
.22036476	.31721872	.60209478	.83655518	.99108916
.22959356	.33193395	.62923260	.86229090	.99534905
.11180360	.17509696	.40695377	.67300387	.96081125
.11741584	.18526051	.43359491	.71052086	.97622647
.05845848	.09686039	.26066575	.49875094	.88606441
.06312928	.10606899	.29134498	.55592335	.93292515
.02364888	.04149597	.13048108	.29506986	.71212563
.02670625	.04802994	.15788153	.36214760	.82097846
.55636602	.67476252	.89342772	.97903665	.99982915
.57290743	.69449149	.90940010	.98497810	.99993659
.33203316	.44940179	.73915852	.91925716	.99802245
.34457783	.46726998	.76304675	.93481885	.99902512
.22445320	.32373484	.61346257	.84669618	.99274520
.23376216	.33848915	.63993425	.87064107	.99609004
.13225834	.20406543	.45408781	.71823608	.97045949
.13897364	.21606610	.48415224	.75811946	.98474150
.06805856	.11251336	.29776195	.55335277	.91997413
.07198423	.12017028	.32220886	.59600292	.94839097
.03927323	.06768905	.20020308	.41749467	.84001667
.04240576	.07415569	.22446451	.46869486	.89471040

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	6	.24941725	.27605333	.35090578	.46011413
		T	.27768654	.35688112	.47163534
7	6	.09557110	.11346553	.16643097	.25156943
		T	.11437357	.17007131	.25962394
7	6	.04778555	.05939735	.09503374	.15618416
		T	.05991126	.09722717	.16149494
7	6	.02331002	.03021504	.05215599	.09218883
		T	.03050821	.05347851	.09564828
7	6	.00932401	.01264350	.02360354	.04497138
		T	.01279845	.02435198	.04712009
7	6	.00466200	.00651003	.01277065	.02552159
		T	.00660183	.01323186	.02691731
7	7	.25000000	.27907449	.36028966	.47730756
		T	.28075620	.36638034	.48884518
7	7	.09965035	.11974882	.17902432	.27349003
		T	.12072159	.18289159	.28191192
7	7	.04953380	.06263312	.10284952	.17172180
		T	.06320619	.10528661	.17756560
7	7	.02447552	.03242372	.05776590	.10412340
		T	.03273703	.05918892	.10785985
7	7	.00990676	.01381347	.02681961	.05242834
		T	.01397256	.02759865	.05469149
7	7	.00466200	.00673405	.01385117	.02861874
		T	.00683321	.01435966	.03018850

TABLE B-4

POWER OF TWO-SAMPLE C1 TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.58467358	.70549402	.91449455	.98591624	.99993172
.60100528	.72429070	.92787958	.99005368	.99997580
.36232873	.48794028	.78042159	.94147948	.99905910
.37585959	.50679845	.80339767	.95439760	.99959982
.24280928	.35113586	.65545785	.87882561	.99589123
.25273608	.36668935	.68165156	.90005174	.99807415
.15351814	.23732374	.51771807	.78541974	.98722476
.16058930	.24952756	.54447704	.81440864	.99274290
.08054183	.13390757	.34996566	.62529492	.95201890
.08542576	.14335987	.37843335	.66963260	.97228033
.04792529	.08362646	.24749589	.49897042	.90211892
.05129310	.09058012	.27259454	.54714106	.93832198
.60815474	.73156804	.93140325	.99066020	.99997410
.62408846	.74927156	.94245979	.99347392	.99999122
.39448777	.52843681	.82061588	.96038573	.99965044
.40828733	.54700672	.84038006	.96943340	.99985235
.26853544	.38769753	.70530263	.91204429	.99832642
.27925971	.40402853	.72971036	.92835668	.99920379
.17492635	.27056459	.57571585	.83623559	.99375839
.18253517	.28352385	.60201472	.86100188	.99677166
.09526210	.15927213	.40929319	.69838386	.97380201
.10042941	.16922582	.43769414	.73791943	.98629527
.05495701	.09723504	.28884789	.56537036	.93807251
.05879424	.10518927	.31666392	.61416433	.96419890

TABLE B-5

POWER OF TWO-SAMPLE MEDIAN TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
2	2	.16666667	.21449982	.26918351	.32975727
		T	.21464351	.26953440	.33038014
4	1	.40000000	.46743107	.53577836	.60304910
		T	.46991573	.54077147	.61034960
3	2	.10000000	.13715522	.18246273	.23573967
		T	.13764968	.18373401	.23810279
4	2	.20000000	.26073485	.32940785	.40397682
		T	.26726595	.34429426	.42833009
3	3	.05000000	.07478896	.10770305	.14955634
		T	.07524361	.10898187	.15213899
6	1	.42857143	.49967771	.57077974	.63963689
		T	.50193021	.57522328	.64599771
5	2	.14285714	.19481534	.25650122	.32661975
		T	.19985414	.26863084	.34752107
4	3	.02857143	.04572295	.07006039	.10296429
		T	.04618485	.07144500	.10592862
4	3	.37142857	.45823057	.54696153	.63326548
		T	.47302014	.57640394	.67475269
6	2	.21428571	.28127808	.35655801	.43739585
		T	.29006014	.37643573	.46947970
5	3	.07142857	.10783265	.15558299	.21498741
		T	.11216717	.16715780	.23688505
4	4	.01428571	.02486926	.04116277	.06490506
		T	.02520858	.04226833	.06746078
4	4	.24285714	.32309597	.41226420	.50590396
		T	.33718101	.44303983	.55312697
7	2	.16666667	.22652652	.29647951	.37443091
		T	.23380143	.31367855	.40337632
6	3	.04761905	.07574444	.11466040	.16554318
		T	.07891281	.12362845	.18346516
6	3	.40476190	.49981610	.59481767	.68443578
		T	.51643022	.62681536	.72763059
5	4	.00793651	.01481297	.02613929	.04370374
		T	.01508419	.02708390	.04602534
5	4	.16666667	.23604725	.31856186	.41081865
		T	.24846139	.34774965	.45873837

TABLE B-5

POWER OF TWO-SAMPLE MEDIAN TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.39480253	.46254547	.63069050	.77491573	.94286569
.39575540	.46387086	.63296654	.77780527	.94517173
.66734665	.72702917	.84885653	.92765487	.98956350
.67655140	.73758478	.86003797	.93637331	.99211009
.29619213	.36242771	.54013749	.70716641	.92051393
.29995788	.36785606	.55011471	.72034528	.93109575
.48178412	.55984858	.73764381	.86736328	.97967387
.51568573	.60221910	.79036365	.91230560	.99278551
.20057409	.26024891	.43720951	.62357041	.88989100
.20501563	.26711407	.45183760	.64520209	.90979992
.70421987	.76288754	.87759267	.94631675	.99384822
.71205072	.77163228	.88615842	.95238765	.99523822
.40298700	.48273825	.67603465	.82838155	.97152811
.43355487	.52277255	.73143043	.88013121	.98893495
.14539961	.19766839	.36566437	.55944910	.86310011
.15077637	.20639037	.38620864	.59213559	.89557396
.71315734	.78356479	.90924161	.97022118	.99849427
.76221275	.83492011	.94787973	.98855950	.99982609
.52041425	.60202039	.77957032	.89860253	.98785082
.56419881	.65532908	.84006531	.94399541	.99725518
.28516059	.36396596	.57629874	.76406702	.95846206
.31996903	.41303760	.65472009	.84440135	.98721534
.09769854	.14069827	.29308250	.48883124	.83037372
.10267197	.14930078	.31627733	.52970003	.87617395
.59888162	.68622564	.85714958	.94982934	.99721688
.65921712	.75396457	.91596606	.98074656	.99971977
.45733151	.54154872	.73443091	.87246968	.98351048
.49844929	.59357115	.79894632	.92483230	.99582301
.22849121	.30227253	.51481631	.71820016	.94669384
.25848499	.34664615	.59373266	.80652146	.98261021
.76424402	.83135556	.94018372	.98420614	.99955547
.81270073	.87902374	.96965041	.99507751	.99996728
.06939151	.10488232	.24152600	.43371037	.80145386
.07416971	.11357945	.26761238	.48345073	.86228265
.50786229	.60397765	.80726958	.92832392	.99568874
.57300568	.68136875	.88290524	.97172889	.99957890

TABLE B-5

POWER OF TWO-SAMPLE MEDIAN TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	3	.08333333	.12652266	.18273437	.25170625
		T	.13345324	.20109336	.28586112
6	4	.02380952	.04172567	.06895781	.10773892
		T	.04396282	.07593208	.12295170
6	4	.26190476	.35254025	.45214924	.55454409
		T	.37007041	.48967450	.61020800
5	5	.00396825	.00804477	.01531453	.02744193
		T	.00822603	.01599887	.02925343
5	5	.10317460	.15792918	.22853029	.31354768
		T	.16774698	.25372566	.35838366
7	4	.01515152	.02810442	.04893728	.08020154
		T	.02967632	.05414366	.09222017
7	4	.19696970	.27875429	.37391009	.47707785
		T	.29462187	.41004134	.53386365
6	5	.00216450	.00471081	.00957265	.01820948
		T	.00484102	.01009894	.01969280
6	5	.06709957	.10977026	.16869328	.24427775
		T	.11748952	.19000388	.28484725
6	5	.39177489	.49998011	.60806663	.70822891
		T	.52188406	.64968083	.76239647
7	5	.00757576	.01543183	.02925926	.05178724
		T	.01645600	.03297943	.06112737
7	5	.12121212	.18720891	.27130308	.37032535
		T	.20071965	.30526496	.42867829
6	6	.00108225	.00255582	.00559789	.01140386
		T	.00263849	.00595956	.01250022
6	6	.04004329	.07085812	.11691136	.18043752
		T	.07644132	.13367947	.21493626
6	6	.28354978	.38755197	.50009873	.61234615
		T	.40950782	.54565282	.67658200
7	6	.00058275	.00147877	.00346023	.00748907
		T	.00153464	.00372221	.00833544
7	6	.02505828	.04750039	.08343631	.13626046
		T	.05160525	.09669595	.16543951
7	6	.20862471	.30312187	.41271125	.52921572
		T	.32377743	.45891359	.59900369
7	7	.00029138	.00080172	.00202074	.00468125
		T	.00083608	.00219496	.00528607
7	7	.01456876	.02988045	.05638417	.09823220
		T	.03269591	.06625698	.12166665
7	7	.14306527	.22350799	.32442983	.43975280
		T	.24152873	.36834500	.51149286

TABLE B-5

POWER OF TWO-SAMPLE MEDIAN TEST (1-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.33160154	.41910466	.64184264	.81990055	.97560872
.38453225	.49123686	.74404255	.90855572	.99630606
.15956757	.22468227	.43282405	.65541623	.93093828
.18711471	.26840665	.52236290	.76569656	.97970686
.65306261	.74184629	.90022252	.97186783	.99914514
.72091839	.81360167	.95106605	.99222027	.99996027
.04640347	.07424634	.19235802	.37663746	.76825953
.05039410	.08197445	.21876320	.43217128	.84443135
.40925879	.51010546	.74375049	.89856553	.99334114
.47487524	.59346836	.83745594	.95818409	.99935242
.12405892	.18167615	.37934329	.60836384	.91614680
.14700338	.21992942	.46655184	.72546850	.97441928
.58138859	.67982593	.86779279	.96046059	.99868395
.65444195	.76103217	.93189289	.98839674	.99993559
.03251520	.05465844	.15692817	.33155577	.73871176
.03597602	.06172036	.18384935	.39298260	.83104742
.33445852	.43466783	.68609126	.86889759	.99069776
.39762910	.51960291	.79365640	.94373639	.99908308
.79436754	.86314467	.96195286	.99281745	.99992102
.85166558	.91515056	.98599270	.99874019	.99999848
.08583326	.13366788	.31561175	.55047127	.89822853
.10507068	.16800209	.40548266	.68333814	.97067349
.47820100	.58706435	.81564576	.94130618	.99789252
.55949051	.68400797	.90343708	.98311685	.99991601
.02167308	.03854840	.12442825	.28665162	.70609606
.02440747	.04447775	.15011032	.35114827	.81449595
.26144007	.35707201	.61990468	.83189277	.98703912
.31912158	.43982856	.73998665	.92434997	.99869130
.71558715	.80322318	.94027806	.98788978	.99985354
.78861309	.87390663	.97744112	.99789464	.99999766
.01504079	.02812584	.10076897	.25087434	.67690208
.01727840	.03324262	.12554045	.31846529	.80166764
.20766536	.29658861	.56175087	.79625087	.98307155
.25956500	.37538105	.69053655	.90468105	.99825408
.64284931	.74463204	.91635887	.98192354	.99976151
.72729721	.83109429	.96732654	.99680379	.99999651
.01000200	.01978227	.07963836	.21617286	.64552804
.01170993	.02392958	.10241463	.28448399	.78622782
.15862679	.23846246	.49937153	.75470803	.97794168
.20330631	.31073092	.63429746	.88016885	.99765968
.55991446	.67422177	.88426423	.97322130	.99961252
.65312196	.77595767	.95256914	.99507912	.99999463

TABLE B-6

POWER OF TWO-SAMPLE MEDIAN TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
2	2	.33333333	.34064370	.36209376	.39629321
		T	.34069974	.36231417	.39677505
3	2	.20000000	.20779141	.23074858	.26765048
		T	.20801832	.23164801	.26964058
4	2	.40000000	.40918066	.43587484	.47767057
		T	.41131003	.44400301	.49458429
3	3	.10000000	.10692590	.12753479	.16129173
		T	.10717943	.12856370	.16365200
5	2	.28571429	.29579857	.32521598	.37157151
		T	.29781774	.33299236	.38798637
4	3	.05714286	.06279054	.07979248	.10825393
		T	.06307547	.08097417	.11105263
6	2	.42857143	.43863480	.46775022	.51288727
		T	.44153137	.47870537	.53533626
5	3	.14285714	.15296617	.18273972	.23052273
		T	.15525668	.19174362	.25013488
4	4	.02857143	.03265717	.04518500	.06686995
		T	.03288872	.04617928	.06934446
4	4	.48571429	.49775603	.53220219	.58440288
		T	.50216367	.54845315	.61632405
7	2	.33333333	.34438776	.37645417	.42642259
		T	.34721741	.38723574	.44878131
6	3	.09523810	.10417853	.13075709	.17416802
		T	.10603109	.13818051	.19081327
5	4	.01587302	.01882511	.02804939	.04455860
		T	.01902220	.02892360	.04683324
5	4	.33333333	.34790844	.38977643	.45374492
		T	.35308304	.40904128	.49217409
7	3	.16666667	.17861282	.21357061	.26896104
		T	.18230813	.22793335	.29965693
6	4	.04761905	.05450864	.07540150	.11078280
		T	.05600113	.08160446	.12543864

TABLE B-6

POWER OF TWO-SAMPLE MEDIAN TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.44109262	.49380843	.64093656	.77766711	.94297162
.44191438	.49502325	.64315905	.78053801	.94527667
.31656128	.37497491	.54331879	.70780192	.92052591
.32000708	.38015588	.55320219	.72095621	.93110707
.53095726	.59144727	.74646421	.86927602	.97971467
.55790129	.62798854	.79655035	.91342443	.99280070
.20722544	.26385577	.43784911	.62365475	.88989158
.21149914	.27060768	.45244777	.64528144	.90980045
.43122505	.49975429	.68000916	.82908453	.97153732
.45787649	.53673514	.73426846	.88055779	.98893873
.14813656	.19901486	.36584636	.55946664	.86310017
.15339933	.20766715	.38637685	.59215143	.89557401
.56959125	.63272040	.78736383	.90008831	.98787284
.60459460	.67890595	.84497319	.94473166	.99726120
.29359792	.36831073	.57694884	.76413520	.95846231
.32670525	.41626481	.65511300	.84443374	.98721541
.09860505	.14109268	.29312029	.48883369	.83037373
.10352891	.14966852	.31631143	.52970217	.87617396
.64777517	.71516969	.86335576	.95077981	.99722479
.69469761	.77258808	.91871225	.98100616	.99972036
.48967036	.56077060	.73869403	.87316712	.98351768
.52509316	.60841908	.80167759	.92519038	.99582517
.23285864	.30435971	.51507008	.71822114	.94669389
.26197225	.34819989	.59388787	.80653171	.98261022
.06975056	.10502363	.24153624	.43371085	.80145386
.07450273	.11370812	.26762130	.48345113	.86228265
.53232266	.61713628	.80942595	.92856574	.99568969
.58995831	.68934504	.88377150	.97178649	.99957895
.34071237	.42363720	.64244713	.81995469	.97560885
.39115757	.49420611	.74433572	.90857416	.99630608
.16091263	.22523739	.43286868	.65541851	.93093828
.18812779	.26878959	.52238696	.76569749	.97970686

TABLE B-6

POWER OF TWO-SAMPLE MEDIAN TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
5	5	.00793651	.00987867	.01610688	.02776134
		T	.01001862	.01675578	.02955164
5	5	.20634921	.22148362	.26535979	.33358618
		T	.22659771	.28477534	.37350339
7	4	.03030303	.03575407	.05254616	.08178923
		T	.03686804	.05731159	.09351315
7	4	.39393939	.41026614	.45666284	.52604407
		T	.41660570	.47976832	.57054265
6	5	.00432900	.00563711	.00994101	.01834530
		T	.00574187	.01044725	.01981768
6	5	.13419913	.14819735	.18926245	.25454764
		T	.15277493	.20704583	.29239062
7	5	.01515152	.01888427	.03071622	.05235531
		T	.01966671	.03422967	.06157386
7	5	.24242424	.26060754	.31275378	.39210442
		T	.26765607	.33894861	.44408064
6	6	.00216450	.00297970	.00575106	.01145480
		T	.00304885	.00610310	.01254644
6	6	.08008658	.09189792	.12716396	.18506073
		T	.09559986	.14203033	.21824534
7	6	.00116550	.00168992	.00353038	.00751039
		T	.00173798	.00378726	.00835448
7	6	.05011655	.05971369	.08892164	.13852536
		T	.06264319	.10109556	.16702294
7	6	.41724942	.43710562	.49272183	.57351496
		T	.44572755	.52324016	.62949471
7	7	.00058275	.00089842	.00204996	.00468927
		T	.00092875	.00222179	.00529313
7	7	.02913753	.03639529	.05904865	.09922638
		T	.03854013	.06836222	.12234616
7	7	.28613054	.30823054	.37068388	.46296494
		T	.31759992	.40447611	.52676263

TABLE B-6

POWER OF TWO-SAMPLE MEDIAN TEST (2-SIDED)
VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.04652338	.07428819	.19236018	.37663753	.76825953
.05050354	.08201181	.21876503	.43217134	.84443135
.41947785	.51498290	.74432049	.89860857	.99334120
.48165822	.59626746	.83766669	.95819328	.99935242
.12470907	.18192354	.37935916	.60836447	.91614680
.14749164	.22009979	.46656044	.72546876	.97441928
.60858491	.69398271	.86986107	.96065793	.99868444
.67215584	.76887086	.93258265	.98843092	.99993560
.03256154	.05467304	.15692874	.33155579	.73871176
.03601746	.06173307	.18384981	.39298261	.83104742
.33923277	.43673112	.68627383	.86890758	.99069777
.40068368	.52073273	.79371914	.94373832	.99908308
.08603747	.13373543	.31561468	.55047134	.89822853
.10521668	.16804573	.40548409	.68333816	.97067349
.48882605	.59186904	.81611565	.94133408	.99789254
.56587561	.68640318	.90356913	.98312065	.99991601
.02168864	.03855275	.12442837	.28665163	.70609606
.02442115	.04448146	.15011043	.35114828	.81449595
.26336549	.35781132	.61995158	.83189451	.98703912
.32031146	.44021620	.74000177	.92435026	.99869130
.01504670	.02812733	.10076900	.25087434	.67690208
.01728349	.03324386	.12554047	.31846529	.80166764
.20852335	.29688626	.56176508	.79625125	.98307155
.26007861	.37553095	.69054086	.90468111	.99825408
.66553647	.75535914	.91751131	.98199695	.99976158
.74024191	.83600353	.96758861	.99681046	.99999651
.01000399	.01978271	.07963836	.21617286	.64552804
.01171161	.02392994	.10241463	.28448399	.78622782
.15896446	.23856665	.49937511	.75470809	.97794168
.20350246	.31078147	.63429848	.88016886	.99765968
.57059645	.67872074	.88461239	.97323639	.99961253
.65884657	.77785685	.95263883	.99508027	.99999463

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST (ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
3	1	.25000000	.30408113	.36269560	.42457845
		T	.30449150	.36361864	.42609511
2	2	.16666667	.21449982	.26918351	.32975727
		T	.21464351	.26953440	.33038014
4	1	.20000000	.24963115	.30500135	.36508824
		T	.25032310	.30659396	.36776176
3	2	.10000000	.13715522	.18246273	.23573967
		T	.13764968	.18373401	.23810279
5	1	.16666667	.21227386	.26431674	.32202364
		T	.21313871	.26634481	.32548849
4	2	.06666667	.09596201	.13348103	.17966062
		T	.09669406	.13544603	.18346000
4	2	.20000000	.26073485	.32940784	.40397682
		T	.26726595	.34429426	.42833009
3	3	.05000000	.07478896	.10770305	.14955634
		T	.07524361	.10898187	.15213899
6	1	.14285714	.18497832	.23393612	.28918808
		T	.18594645	.23624214	.29318643
5	2	.04761905	.07124868	.10272598	.14292084
		T	.07209714	.10508679	.14763924
5	2	.14285714	.19481534	.25650122	.32661975
		T	.19985414	.26863084	.34752107
4	3	.02857143	.04572295	.07006039	.10296429
		T	.04618485	.07144500	.10592862
4	3	.11428571	.16198699	.22063100	.28933249
		T	.16829392	.23631116	.31706640
4	3	.20000000	.27023957	.35089695	.43876386
		T	.27786098	.36807910	.46619654
7	1	.12500000	.16412182	.21030230	.26320027
		T	.16514962	.21278338	.26755714
7	1	.25000000	.31011727	.37573900	.44511493
		T	.31169979	.37918801	.45057135
6	2	.03571429	.05518162	.08197661	.11725866
		T	.05607058	.08452682	.12250198
6	2	.10714286	.15158397	.20647283	.27123171
		T	.15565882	.21671806	.28963203
6	2	.21428571	.28127808	.35655801	.43739585
		T	.29006014	.37643573	.46947970

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.48823116	.55203144	.70186270	.82279295	.95637437
.49038893	.55483521	.70599835	.82740912	.95939012
.39480253	.46254547	.63069050	.77491573	.94286569
.39575540	.46387086	.63296654	.77780527	.94517173
.42852600	.49369886	.65286476	.78783898	.94531133
.43240605	.49883389	.66074251	.79690073	.95143652
.29619213	.36242771	.54013749	.70716641	.92051393
.29995788	.36785606	.55011471	.72034528	.93109575
.38421340	.44936488	.61355475	.75845157	.93530472
.38932530	.45623488	.62445464	.77133214	.94431785
.23432814	.29662075	.47430205	.65376746	.90079395
.24060300	.30596193	.49263260	.67909779	.92186603
.48178412	.55984858	.73764381	.86736328	.97967387
.51568573	.60221910	.79036365	.91230560	.99278551
.20057409	.26024891	.43720951	.62357041	.88989100
.20501563	.26711407	.45183760	.64520209	.90979992
.34974515	.41421617	.58099353	.73315697	.92614917
.35572692	.42236119	.59429777	.74925955	.93779281
.19216342	.25009137	.42386889	.61011394	.88311041
.20019622	.26238445	.44941709	.64690883	.91492479
.40298700	.48273825	.67603465	.82838155	.97152811
.43355487	.52277255	.73143043	.88013121	.98893495
.14539961	.19766839	.36566437	.55944910	.86310011
.15077637	.20639037	.38620864	.59213559	.89557396
.36609751	.44799048	.65184490	.81593433	.97026367
.40748195	.50297352	.72885944	.88662120	.99180688
.52959561	.61872309	.80769980	.92406633	.99456725
.56636393	.66236668	.85263006	.95309947	.99829787
.32200981	.38548098	.55337935	.71099828	.91769717
.32860688	.39456649	.56860311	.72982190	.93173057
.51615713	.58662730	.74667863	.86610908	.97686117
.52358377	.59579993	.75826070	.87672539	.98097672
.16174143	.21549021	.38378931	.57348251	.86705914
.17090392	.22985133	.41517524	.62039669	.90918495
.34427337	.42309718	.62426682	.79327107	.96336675
.37226300	.46114787	.68156619	.85083683	.98503416
.52041425	.60202039	.77957032	.89860253	.98785082
.56419881	.65532908	.84006531	.94399541	.99725518

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
5	3	.01785714	.03019552	.04867975	.07495852
		T	.03064967	.05011262	.07817364
5	3	.07142857	.10783265	.15558299	.21498741
		T	.11216717	.16715780	.23688505
5	3	.14285714	.20276153	.27546378	.35891513
		T	.20990670	.29248423	.38753039
5	3	.23214286	.31163680	.40096110	.49570126
		T	.32125271	.42204491	.52821880
4	4	.01428571	.02486926	.04116277	.06490506
		T	.02520858	.04226833	.06746078
4	4	.11428571	.16837581	.23638735	.31696844
		T	.17408304	.25060448	.34187298
7	2	.02777778	.04411074	.06722768	.09847644
		T	.04499754	.06983994	.10398124
7	2	.08333333	.12160694	.17047015	.22995203
		T	.12502192	.17937016	.24649215
7	2	.16666667	.22652652	.29647951	.37443091
		T	.23380143	.31367855	.40337632
6	3	.01190476	.02108574	.03548362	.05684158
		T	.02151588	.03690113	.06015241
6	3	.04761905	.07574444	.11466040	.16554318
		T	.07891281	.12362845	.18346516
6	3	.16666667	.23577522	.31813945	.41048053
		T	.24380367	.33689643	.44120749
5	4	.00793651	.01481297	.02613929	.04370374
		T	.01508419	.02708390	.04602534
5	4	.03968254	.06509445	.10125670	.14971033
		T	.06846655	.11104770	.16969278
5	4	.07142857	.11264528	.16828875	.23872974
		T	.11714742	.18036792	.26140440
5	4	.14285714	.20741268	.28647168	.37733370
		T	.21722258	.31000450	.41673214
5	4	.21428571	.29653053	.39059881	.49131930
		T	.30843486	.41721379	.53273900
7	3	.00833333	.01536117	.02682575	.04446886
		T	.01575883	.02818704	.04776204
7	3	.03333333	.05543315	.08743081	.13107794
		T	.05786314	.09465401	.14619376
7	3	.08333333	.12652266	.18273437	.25170625
		T	.13345324	.20109336	.28586112
7	3	.12500000	.18454868	.25899765	.34633854
		T	.19146919	.27598449	.37550746
7	3	.20000000	.27761442	.36743579	.46503127
		T	.28831930	.39163831	.50324262

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.11045937	.15609400	.31300578	.50829462	.83925962
.11654647	.16635979	.33921357	.55248834	.88576964
.28516059	.36396596	.57629874	.76406702	.95846206
.31996903	.41303760	.65472009	.84440135	.98721534
.44953665	.54266569	.75470479	.89743892	.99195729
.48978641	.59263529	.81143255	.93707332	.99761025
.59056676	.68026564	.85663829	.95148547	.99772830
.63238441	.72757033	.89856425	.97386295	.99947050
.09769854	.14069827	.29308250	.48883124	.83037372
.10267197	.14930078	.31627733	.52970003	.87617396
.40698564	.50185625	.72583861	.88286902	.99054697
.44335955	.54859442	.78291706	.92506721	.99701919
.13885665	.18878582	.35105400	.54213099	.85235078
.14869790	.20453783	.38704822	.59776710	.90414290
.29905011	.37571656	.58020118	.76159162	.95530926
.32504072	.41215498	.63904102	.82435365	.98121115
.45733151	.54154872	.73443091	.87246968	.98351048
.49844929	.59357115	.79894632	.92483230	.99582301
.08685300	.12685829	.27264368	.46631351	.81777278
.09335557	.13819683	.30366830	.52132553	.87861247
.22849121	.30227253	.51481631	.71820016	.94669384
.25848499	.34664615	.59373266	.80652146	.98261021
.50789856	.60464309	.80971111	.93114109	.99638754
.54973812	.65460249	.85973795	.96076981	.99909069
.06939151	.10488232	.24152600	.43371037	.80145386
.07416971	.11357945	.26761238	.48345073	.86228265
.21092669	.28396206	.49930847	.70931472	.94605317
.24493276	.33490792	.59123359	.81148569	.98522411
.32241285	.41578184	.65638326	.84372576	.98607013
.35772676	.46393581	.72324807	.89844356	.99566754
.47536618	.57469573	.79127487	.92347361	.99596586
.52994161	.64069362	.85823988	.96273754	.99931693
.59232348	.68724001	.86876841	.95969422	.99855863
.64552184	.74674361	.91795798	.98291853	.99982149
.07012065	.10541139	.24074999	.43111242	.79821359
.07680054	.11740674	.27565017	.49583120	.87306591
.18724707	.25553968	.46400578	.67752001	.93512789
.21366302	.29623551	.54316288	.77288361	.97818942
.33160154	.41910466	.64184264	.81990055	.97560872
.38453225	.49123686	.74404255	.90855572	.99630606
.44252351	.54199716	.76658213	.91072113	.99484409
.48406151	.59375088	.82365143	.94743421	.99864794
.56462190	.66009460	.84983360	.95109029	.99803876
.61456522	.71710980	.90000287	.97661740	.99966408

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
6	4	.00476190	.00943043	.01757558	.03089671
		T	.00965437	.01840061	.03303185
6	4	.02380952	.04172567	.06895781	.10773892
		T	.04396282	.07593208	.12295170
6	4	.04761905	.07940762	.12489455	.18570354
		T	.08310163	.13541214	.20657313
6	4	.09047619	.14101882	.20767271	.28972926
		T	.14798668	.22581947	.32255603
6	4	.14761905	.21722242	.30248163	.39983504
		T	.22737369	.32689687	.44053119
5	5	.00396825	.00804477	.01531453	.02744193
		T	.00822603	.01599887	.02925343
5	5	.03968254	.06808887	.10984155	.16701803
		T	.07115659	.11885579	.18542910
5	5	.17857143	.25947998	.35595965	.46260870
		T	.26991487	.38002081	.50084172
7	4	.00303030	.00631809	.01234863	.02267924
		T	.00650540	.01307328	.02464107
7	4	.01515152	.02810442	.04893728	.08020154
		T	.02967632	.05414366	.09222017
7	4	.03333333	.05826770	.09574161	.14820576
		T	.06137838	.10505083	.16755879
7	4	.06060606	.10020780	.15573997	.22813470
		T	.10539424	.17017569	.25593812
7	4	.10606061	.16430700	.23981382	.33076124
		T	.17299508	.26198304	.36983186
7	4	.15454545	.22858669	.31897606	.42138050
		T	.23969878	.34548924	.46497857
7	4	.20909091	.29779900	.40073361	.51124402
		T	.30981136	.42730090	.55164773
6	5	.00216450	.00471081	.00957265	.01820948
		T	.00484102	.01009894	.01969280
6	5	.01298701	.02471452	.04402394	.07360422
		T	.02629670	.04937722	.08618430
6	5	.02380952	.04382101	.07538656	.12154013
		T	.04604908	.08243406	.13695414
6	5	.05411255	.09104895	.14378382	.21367954
		T	.09697901	.16056454	.24643014
6	5	.08874459	.14220025	.21371920	.30226814
		T	.15039354	.23538007	.34163172
6	5	.11904762	.18520695	.27026877	.37118083
		T	.19428097	.29291659	.40992840
6	5	.17965368	.26338475	.36358783	.47424729
		T	.27619221	.39289267	.52014763
6	5	.23809524	.33480445	.44397851	.55760225
		T	.34941707	.47552422	.60413718

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.05135630	.08092233	.20326640	.38936920	.77555698
.05596335	.08967610	.23198250	.44784432	.85222784
.15956757	.22468227	.43282405	.65541623	.93093828
.18711471	.26840665	.52236290	.76569656	.97970686
.26171534	.35063972	.59737902	.80720977	.98129763
.29593920	.39959157	.67275081	.87413151	.99435933
.38409293	.48553084	.72758037	.89263775	.99361279
.43300041	.54886052	.80241730	.94248086	.99874391
.50352281	.60660133	.82120309	.94087774	.99761747
.55926365	.67280696	.88365484	.97370688	.99969286
.04640347	.07424634	.19235802	.37663746	.76825953
.05039410	.08197445	.21876320	.43217128	.84443135
.24004453	.32713296	.57572157	.79373322	.97955883
.27104585	.37255954	.64934722	.86176695	.99355123
.57191418	.67580979	.87308575	.96585343	.99925206
.62154363	.73133531	.91692482	.98429455	.99988525
.03923919	.06413002	.17392025	.35287009	.75212534
.04365068	.07283319	.20479686	.41945331	.84476636
.12405892	.18167615	.37934329	.60836384	.91614680
.14700338	.21992942	.46655183	.72546850	.97441928
.21668824	.30011301	.54691233	.77337787	.97633492
.24983224	.34946473	.62979646	.85217669	.99314028
.31595100	.41515734	.67080891	.86226096	.99092053
.35989351	.47530376	.75124696	.92168131	.99804826
.43261516	.53875563	.77628262	.92131810	.99648824
.48900638	.60909890	.85022496	.96379621	.99953531
.52910723	.63440237	.84507670	.95359163	.99859557
.58769300	.70229483	.90388346	.98106560	.99985195
.62098528	.72176869	.90118480	.97658910	.99963995
.67105975	.77511474	.93796685	.98982106	.99994822
.03251520	.05465844	.15692817	.33155577	.73871176
.03597602	.06172036	.18384935	.39298260	.83104742
.11584483	.17218588	.36950724	.60204589	.91599841
.14021116	.21326835	.46456314	.72943729	.97692282
.18417357	.26316748	.50925887	.74796572	.97266080
.21182676	.30612745	.58820547	.82845688	.99146521
.29975366	.39832388	.65740758	.85548309	.99045616
.35203304	.47036525	.75409565	.92598229	.99844568
.40381925	.51180395	.75988634	.91505331	.99625362
.46213342	.58613665	.84088843	.96220908	.99956508
.48168023	.59340684	.82620782	.94927821	.99873554
.53555311	.65763368	.88437221	.97654308	.99981704
.58699746	.69297640	.88785335	.97286866	.99957526
.64533055	.75643238	.93316591	.98939264	.99995407
.66662523	.76307292	.92356008	.98385838	.99981158
.72223275	.81986745	.95801486	.99447425	.99998451

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	5	.00126263	.00292398	.00629155	.01261318
		T	.00302168	.00671063	.01386067
7	5	.00757576	.01543183	.02925926	.05178724
		T	.01645600	.03297943	.06112737
7	5	.01515152	.02960564	.05382049	.09126954
		T	.03130014	.05952363	.10448524
7	5	.03282828	.05941568	.10026321	.15820247
		T	.06338235	.11241813	.18376484
7	5	.05808081	.09930316	.15834030	.23623071
		T	.10562272	.17629680	.27114381
7	5	.08333333	.13715467	.21076483	.30334230
		T	.14512164	.23195061	.34180412
7	5	.11868687	.18713910	.27574376	.38103172
		T	.19712709	.30068096	.42343154
7	5	.16414141	.24725649	.34864141	.46209911
		T	.25970982	.37790141	.50883620
7	5	.21717172	.31343439	.42443694	.54176575
		T	.32797516	.45648573	.58974113
6	6	.00108225	.00255582	.00559789	.01140386
		T	.00263849	.00595956	.01250022
6	6	.01298701	.02596893	.04819228	.08323471
		T	.02741988	.05319584	.09509001
6	6	.07142857	.12090148	.19037751	.27983796
		T	.12774090	.20915812	.31495052
6	6	.23809524	.34161502	.45883731	.57987568
		T	.35550432	.48859208	.62296009
7	6	.00058275	.00147877	.00346023	.00748907
		T	.00153464	.00372221	.00833544
7	6	.00407925	.00901812	.01842385	.03489260
		T	.00970406	.02112477	.04219141
7	6	.00757576	.01626933	.03223742	.05911270
		T	.01727206	.03595853	.06855013
7	6	.01923077	.03754174	.06789703	.11410004
		T	.04061095	.07808346	.13714712
7	6	.03379953	.06289409	.10826182	.17297943
		T	.06751752	.12263553	.20332795
7	6	.04545455	.08255126	.13861765	.21593663
		T	.08788663	.15444423	.24773333
7	6	.07342657	.12526332	.19831886	.29235244
		T	.13388081	.22183947	.33577281
7	6	.10606061	.17263075	.26095293	.36784496
		T	.18380664	.28967735	.41766234
7	6	.13869464	.21821126	.31890021	.43492178
		T	.23074557	.34948830	.48519117
7	6	.16666667	.25602178	.36553521	.48738302
		T	.26906474	.39590896	.53492595
7	6	.21911422	.32157179	.44016984	.56473237
		T	.33699464	.47360359	.61340570

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.02362885	.04149020	.13048091	.29506986	.71212563
.02668877	.04802505	.15788139	.36214759	.82097845
.08583326	.13366788	.31561175	.55047127	.89822853
.10507068	.16800209	.40548266	.68333814	.97067349
.14480910	.21567230	.45398723	.70629283	.96552947
.16982263	.25649929	.53740597	.79867017	.98951074
.23416504	.32633035	.59125849	.81630255	.98648287
.27792709	.39071072	.69110238	.89831880	.99751035
.33100443	.43748050	.70361748	.88799336	.99449538
.38609601	.51195683	.79591110	.94759813	.99932535
.41044754	.52448454	.78166817	.93178127	.99809912
.46696285	.59540650	.85344284	.96852709	.99974119
.49590338	.61099653	.84390039	.95873055	.99925074
.55410276	.67904360	.90091625	.98246443	.99991017
.57861177	.68844204	.88918269	.97439008	.99965361
.63878148	.75432435	.93576196	.99065166	.99996996
.65545633	.75647113	.92369897	.98470180	.99984797
.71328253	.81569261	.95898544	.99504112	.99998964
.02167308	.03854840	.12442825	.28665162	.70609606
.02440747	.04447775	.15011033	.35114827	.81449595
.13421163	.20273769	.43865270	.69465836	.96356386
.15711112	.24081395	.51957533	.78706224	.98854163
.38553008	.50018142	.76574545	.92548937	.99787161
.43853056	.56834630	.83841725	.96421785	.99969162
.69381345	.79157866	.94237492	.99029319	.99994266
.74379485	.84058747	.96792748	.99658707	.99999489
.01504079	.02812584	.10076897	.25087434	.67690208
.01727840	.03324262	.12554044	.31846529	.80166764
.06146684	.10108373	.26638393	.50131534	.88125993
.07753639	.13153740	.35646251	.64642380	.96723729
.10063392	.15962803	.38143146	.64689115	.95420988
.12004551	.19382570	.46366976	.75024023	.98575603
.17875629	.26206103	.52500580	.77354796	.98168901
.22092487	.32793644	.64057421	.87725421	.99703840
.25755547	.35896270	.63840583	.85460483	.99220864
.30917899	.43365797	.74489758	.93070049	.99908698
.31331255	.42540869	.70981729	.90079109	.99681317
.36462168	.49559855	.79529685	.95138223	.99954679
.40291866	.52171611	.78890227	.93899847	.99872708
.46719284	.60222217	.86682641	.97513457	.99987337
.48590834	.60498021	.84545809	.96106395	.99939939
.55503679	.68598333	.91132843	.98652976	.99995857
.55663334	.67293886	.88658861	.97519880	.99972211
.62260398	.74590700	.93754606	.99194896	.99998328
.61044402	.72325852	.91498906	.98422613	.99989128
.66973568	.78541831	.95242721	.99456058	.99999148
.68335842	.78574216	.94291305	.99106959	.99995989
.73975281	.84059744	.97011970	.99717924	.99999715

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	7	.00029138	.00080172	.00202074	.00468125
		T	.00083608	.00219496	.00528607
7	7	.00407925	.00950823	.02030821	.03987263
		T	.01014308	.02286961	.04689127
7	7	.02651515	.05232537	.09475485	.15800806
		T	.05607578	.10692296	.18457590
7	7	.10606061	.17722442	.27277231	.38852156
		T	.18788956	.30020677	.43562488

TABLE B-7

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.01000200	.01978227	.07963836	.21617286	.64552804
.01170993	.02392958	.10241463	.28448401	.78622783
.07221317	.12110040	.32402178	.59445013	.94262911
.08771645	.15026021	.40464221	.70730185	.98210625
.24362099	.34895429	.64497892	.86910681	.99524605
.28992398	.41695552	.74143460	.93344576	.99931489
.51506776	.63996167	.87653420	.97464419	.99979475
.57906571	.71257385	.92837069	.99100002	.99998453

TABLE B-8

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
3	2	.20000000	.20779141	.23074858	.26765048
		T	.20801832	.23164801	.26964058
4	2	.13333333	.14066165	.16237316	.19764379
		T	.14103443	.16386536	.20099587
3	3	.10000000	.10692590	.12753479	.16129173
		T	.10717943	.12856370	.16365200
5	2	.09523810	.10187743	.12166246	.15416186
		T	.10234166	.12353964	.15844392
4	3	.05714286	.06279054	.07979248	.10825393
		T	.06307547	.08097417	.11105263
4	3	.22857143	.23933199	.27076172	.32040513
		T	.24216254	.28168217	.34351116
7	1	.25000000	.25696759	.27751287	.31058916
		T	.25735194	.27902173	.31387794
6	2	.07142857	.07737682	.09520518	.12481150
		T	.07788961	.09729926	.12965928
6	2	.21428571	.22438045	.25394885	.30091363
		T	.22623120	.26114417	.31633080
5	3	.03571429	.04024663	.05405567	.07768673
		T	.04054574	.05532182	.08077487
5	3	.14285714	.15296617	.18273972	.23052273
		T	.15525668	.19174362	.25013488
4	4	.02857143	.03265717	.04518500	.06686995
		T	.03288872	.04617928	.06934446
4	4	.22857143	.24214801	.28159622	.34323026
		T	.24482723	.29181371	.36442409
7	2	.05555556	.06087670	.07691493	.10382841
		T	.06140956	.07911150	.10898474
7	2	.16666667	.17637753	.20494673	.25071005
		T	.17806681	.21157580	.26512246
6	3	.02380952	.02746025	.03871538	.05839047
		T	.02775722	.03999727	.06160380
6	3	.09523810	.10417853	.13075709	.17416802
		T	.10603109	.13818051	.19081327
5	4	.01587302	.01882511	.02804939	.04455860
		T	.01902220	.02892360	.04683324
5	4	.07936508	.08798542	.11372748	.15611534
		T	.09004489	.12203717	.17492640
5	4	.14285714	.15546539	.19251397	.25164369
		T	.15794021	.20214571	.27225433

TABLE B-8

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.31656128	.37497491	.54331879	.70780192	.92052591
.32000708	.38015588	.55320219	.72095621	.93110707
.24509596	.30281746	.47560365	.65397722	.90079632
.25101045	.31189799	.49385204	.67929014	.92186812
.20722544	.26385577	.43784911	.62365475	.88989158
.21149914	.27060768	.45244777	.64528144	.90980045
.19856368	.25358325	.42450228	.61020039	.88311107
.20626224	.26564714	.44998809	.64698409	.91492533
.14813656	.19901486	.36584636	.55946664	.86310017
.15339933	.20766715	.38637685	.59215143	.89557401
.38449209	.45837849	.65385738	.81621909	.97026581
.42209059	.51061395	.73004192	.88674886	.99180737
.35453670	.40720397	.56038335	.71288467	.91777544
.36012266	.41541969	.57516021	.73154068	.93179788
.16586803	.21764565	.38413636	.57352394	.86705937
.17473995	.23181615	.41547631	.62043092	.90918512
.36204195	.43327124	.62633183	.79358263	.96336956
.38756574	.46950578	.68305098	.85102914	.98503538
.11177122	.15669090	.31307074	.50829950	.83925963
.11777713	.16691079	.33927123	.55249253	.88576964
.29359792	.36831073	.57694884	.76413520	.95846231
.32670525	.41626481	.65511300	.84443374	.98721541
.09860505	.14109268	.29312029	.48883369	.83037373
.10352891	.14966852	.31631143	.52970217	.87617396
.42142746	.50936588	.72697784	.88298868	.99054740
.45493607	.55416213	.78358398	.92511929	.99701927
.14168094	.19020801	.35126127	.54215313	.85235088
.15127518	.20580394	.38722148	.59778448	.90414297
.31099059	.38227149	.58138695	.76174884	.95531031
.33529959	.41752787	.63989353	.82445115	.98121161
.08755373	.12715713	.27267087	.46631517	.81777278
.09399770	.13846465	.30369138	.52132688	.87861247
.23285864	.30435971	.51507008	.71822114	.94669389
.26197225	.34819989	.59388787	.80653171	.98261022
.06975056	.10502363	.24153624	.43371085	.80145386
.07450273	.11370812	.26762130	.48345113	.86228265
.21402301	.28536888	.49945648	.70932502	.94605318
.24726025	.33587328	.59131185	.81148970	.98522411
.32889082	.41883608	.65673655	.84375302	.98607018
.36276389	.46611212	.72344166	.89845432	.99566755

TABLE B-8

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE

M	N	ALPHA	D= .2	D= .4	D= .6
7	3	.01666667	.01963615	.02889600	.04541375
		T	.01992073	.03014742	.04863180
7	3	.06666667	.07440482	.09763169	.13625082
		T	.07592784	.10385011	.15058529
7	3	.16666667	.17861282	.21357061	.26896104
		T	.18230813	.22793335	.29965693
7	3	.25000000	.26486759	.30787481	.37446916
		T	.26806117	.31993537	.39908317
6	4	.00952381	.01168840	.01857896	.03131376
		T	.01185841	.01935624	.03341938
6	4	.04761905	.05450864	.07540150	.11078280
		T	.05600113	.08160446	.12543864
6	4	.09523810	.10628781	.13915283	.19279998
		T	.10852224	.14802973	.21238631
6	4	.18095238	.19573947	.23880854	.30636759
		T	.19944789	.25298645	.33584105
5	5	.00793651	.00987867	.01610688	.02776134
		T	.01001862	.01675578	.02955164
5	5	.07936508	.08978407	.12094613	.17232985
		T	.09172359	.12874267	.18982963
7	4	.00606061	.00767746	.01291776	.02290118
		T	.00782434	.01360875	.02484351
7	4	.03030303	.03575407	.05254616	.08178923
		T	.03686804	.05731159	.09351315
7	4	.06666667	.07615807	.10473529	.15243473
		T	.07816696	.11287751	.17093037
7	4	.12121212	.13458019	.17398212	.23717784
		T	.13766741	.18605469	.26314322
7	4	.21212121	.22864412	.27641121	.35024840
		T	.23316864	.29349036	.38502331
6	5	.00432900	.00563711	.00994101	.01834530
		T	.00574187	.01044725	.01981768
6	5	.02597403	.03108646	.04693627	.07484159
		T	.03223168	.05188212	.08715898
6	5	.04761905	.05588483	.08107481	.12403140
		T	.05741706	.08743593	.13897862
6	5	.10822511	.12116310	.15944470	.22127704
		T	.12479362	.17370355	.25212244
6	5	.17748918	.19400202	.24193285	.31657646
		T	.19859181	.25940612	.35259877
6	5	.23809524	.25678686	.31043827	.39218267
		T	.26141485	.32764846	.42637075

TABLE B-8

POWER OF TWO-SAMPLE KOLMOGOROV-SMIRNOV TEST
(TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.07052650	.10557520	.24076280	.43111308	.79821359
.07716356	.11754912	.27566055	.49583170	.87306591
.18971714	.25664872	.46411927	.67752772	.93512790
.21562793	.29705835	.54323233	.77288741	.97818942
.34071237	.42363720	.64244713	.81995469	.97560885
.39115757	.49420611	.74433572	.90857416	.99630608
.45781906	.54984777	.76772962	.91083740	.99484450
.49586477	.59925909	.82424977	.94747526	.99864799
.05151815	.08098088	.20326975	.38936932	.77555698
.05611009	.08972792	.23198530	.44784441	.85222784
.16091263	.22523739	.43286868	.65541851	.93093828
.18812779	.26878959	.52238696	.76569749	.97970686
.26502517	.35208483	.59751466	.80721808	.98129764
.29842149	.40057270	.67281902	.87413437	.99435933
.39243063	.48944377	.72802038	.89266991	.99361284
.43900824	.55136947	.80261537	.94249016	.99874391
.04652338	.07428819	.19236018	.37663753	.76825953
.05050354	.08201181	.21876503	.43217134	.84443135
.24241535	.32811891	.57580165	.79373730	.97955883
.27285651	.37324734	.64939001	.86176853	.99355124
.03931966	.06415710	.17392152	.35287013	.75212534
.04372184	.07285641	.20479787	.41945333	.84476636
.12470907	.18192354	.37935916	.60836447	.91614680
.14749164	.22009979	.46656044	.72546876	.97441928
.21854610	.30087485	.54697274	.77338094	.97633493
.25117234	.34995554	.62982411	.85217760	.99314028
.32013162	.41695714	.67096792	.86226976	.99092054
.36290368	.47646006	.75131965	.92168395	.99804826
.44231410	.54326240	.77677099	.92135205	.99648829
.49573863	.61183682	.85042167	.96380428	.99953532
.03256154	.05467304	.15692874	.33155579	.73871176
.03601746	.06173307	.18384981	.39298261	.83104742
.11633259	.17236396	.36951739	.60204624	.91599841
.14056026	.21338327	.46456803	.72943741	.97692282
.18518536	.26354797	.50928225	.74796659	.97266080
.21257931	.30638400	.58821729	.82845719	.99146521
.30318666	.39976681	.65752712	.85548926	.99045617
.35429089	.47118397	.75413907	.92598357	.99844568
.41056404	.51475480	.76015378	.91506818	.99625363
.46670869	.58787830	.84099184	.96221246	.99956508
.49189582	.59802478	.82666623	.94930672	.99873557
.54266086	.66043444	.88455261	.97654942	.99981704

TABLE B-9

POWER OF TWO-SAMPLE T-TEST (ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M	N	ALPHA	D= .2	D= .4	D= .6
7	2	.25000000	.33389279	.42703639	.52444164
7	2	.10000000	.14765197	.20845694	.28188806
7	2	.05000000	.07802674	.11652772	.16676747
7	2	.02500000	.04073892	.06362124	.09532827
7	2	.01000000	.01702466	.02783301	.04374311
7	2	.00500000	.00873233	.01466634	.02371406
6	3	.25000000	.34592426	.45293407	.56347988
6	3	.10000000	.15502674	.22694162	.31451485
6	3	.05000000	.08253924	.12879740	.19036283
6	3	.02500000	.04335019	.07118211	.11087339
6	3	.01000000	.01822522	.03153550	.05188789
6	3	.00500000	.00938115	.01674185	.02846364
5	4	.25000000	.35148898	.46487128	.58118068
5	4	.10000000	.15848459	.23570699	.32997705
5	4	.05000000	.08467041	.13470505	.20181785
5	4	.02500000	.04459033	.07486582	.11856376
5	4	.01000000	.01879855	.03336096	.05599491
5	4	.00500000	.00969199	.01777225	.03088550
7	3	.25000000	.34868715	.45886976	.57231361
7	3	.10000000	.15709613	.23220350	.32384013
7	3	.05000000	.08400050	.13287239	.19832102
7	3	.02500000	.04431020	.07406102	.11694606
7	3	.01000000	.01873441	.03318047	.05564470
7	3	.00500000	.00968274	.01776005	.03090171
6	4	.25000000	.35600875	.47454566	.59538137
6	4	.10000000	.16170381	.24394365	.34452949
6	4	.05000000	.08686865	.14090654	.21396413
6	4	.02500000	.04599567	.07914739	.12766538
6	4	.01000000	.01952344	.03575061	.06152325
6	4	.00500000	.01011436	.01923126	.03443556
5	5	.25000000	.35835774	.47956005	.60268099
5	5	.10000000	.16319325	.24775807	.35123732
5	5	.05000000	.08779955	.14353925	.21910476
5	5	.02500000	.04654445	.08082541	.13122599
5	5	.01000000	.01978118	.03660441	.06349776
5	5	.00500000	.01025562	.01972202	.03563047
7	4	.25000000	.35960718	.48222782	.60655379
7	4	.10000000	.16430445	.25062940	.35631581
7	4	.05000000	.08866554	.14602722	.22402344
7	4	.02500000	.04715838	.08274465	.13537531
7	4	.01000000	.02013287	.03780476	.06634777
7	4	.00500000	.01047371	.02050683	.03760274

TABLE B-9

POWER OF TWO-SAMPLE T-TEST (ONE-SIDED) VS. NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.62038702	.70940740	.87786682	.96220755	.99865560
.36582867	.45666996	.68275897	.85503758	.98678695
.22905886	.30246662	.51689051	.72552358	.95594646
.13722051	.19001967	.36576357	.57436696	.89192848
.06616338	.09642816	.21200367	.38099800	.74961184
.03695396	.05556260	.13275549	.26069133	.61118768
.66923490	.76292983	.92079645	.98234783	.99976100
.41390210	.51904881	.76106037	.91463811	.99637331
.26710599	.35674210	.60503403	.81501944	.98410217
.16413036	.23140738	.44849135	.68083015	.95095181
.08132065	.12161384	.27449072	.48433046	.85529003
.04617663	.07160348	.17803193	.34781092	.74093488
.69073932	.78550695	.93613999	.98793521	.99989956
.43640339	.54754713	.79302674	.93479529	.99812078
.28552858	.38267261	.64389473	.84906900	.99058052
.17751303	.25189542	.48730099	.72543448	.96744906
.08906686	.13454435	.30576180	.53224226	.89162469
.05096602	.08001817	.20158029	.39074125	.79149608
.68002899	.77435179	.92878252	.98537429	.99984452
.42755685	.53647584	.78110666	.92770000	.99760267
.28001059	.37507421	.63325403	.84052293	.98929687
.17481505	.24795561	.48081265	.71916538	.96599238
.08851533	.13380979	.30512261	.53293735	.89421446
.05108879	.08039502	.20375074	.39658455	.80169571
.70768220	.80283750	.94679605	.99127390	.99995215
.45745088	.57383679	.82056331	.95024517	.99903849
.30511271	.41010157	.68318323	.88046859	.99490880
.19352384	.27649425	.53284293	.77433202	.98127092
.09971468	.15256964	.34956350	.59683287	.93163535
.05818568	.09297606	.23873020	.45731062	.85862502
.71627105	.81145273	.95171635	.99265475	.99996772
.46705316	.58564101	.83215184	.95612172	.99929269
.31333002	.42144826	.69848853	.89158281	.99603827
.19974213	.28592762	.54936418	.79054164	.98470172
.10349662	.15890370	.36421507	.61674497	.94110783
.06060528	.09727886	.25053071	.47693466	.87415152
.72080159	.81595739	.95419993	.99331483	.99997401
.47434157	.59459461	.84080225	.96035008	.99945213
.32126395	.43246550	.71333281	.90211406	.99699235
.20709951	.29721954	.56940053	.80999625	.98845272
.10908086	.16843568	.38695145	.64782767	.95496795
.06471218	.10476096	.27195861	.51321126	.90165210

TABLE B-10

POWER OF TWO-SAMPLE T-TEST (TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M	N	ALPHA	D= .2	D= .4	D= .6
6	1	.250	.25703103	.27776918	.31117351
6	1	.100	.10440360	.11756550	.13932807
6	1	.050	.05267695	.06074400	.07429894
6	1	.025	.02652709	.03115952	.03904438
6	1	.010	.01068593	.01278053	.01639202
6	1	.005	.00536403	.00647980	.00841760
5	2	.250	.26168534	.29576283	.34940657
5	2	.100	.10733489	.12920029	.16513035
5	2	.050	.05446501	.06795726	.09071925
5	2	.025	.02754993	.03533987	.04876096
5	2	.010	.01114664	.01468813	.02091890
5	2	.005	.00560891	.00750122	.01086982
4	3	.250	.26400264	.30460672	.36778991
4	3	.100	.10879918	.13499376	.17789385
4	3	.050	.05536005	.07157780	.09898206
4	3	.025	.02806278	.03745149	.05371705
4	3	.010	.01137802	.01565785	.02325902
4	3	.005	.00573201	.00802229	.01214696
7	1	.250	.25735194	.27902173	.31387794
7	1	.100	.10471054	.11879078	.14207242
7	1	.050	.05291205	.06169622	.07648200
7	1	.025	.02668757	.03181737	.04058185
7	1	.010	.01077237	.01313933	.01724743
7	1	.005	.00541507	.00669323	.00893237
6	2	.250	.26256372	.29912980	.35645623
6	2	.100	.10807008	.13212432	.17162687
6	2	.050	.05499710	.07012439	.09571847
6	2	.025	.02789990	.03679363	.05221975
6	2	.010	.01132917	.01546214	.02282007
6	2	.005	.00571492	.00795618	.01200827
5	3	.250	.26567503	.31095090	.38083919
5	3	.100	.11008371	.14008649	.18913489
5	3	.050	.05625009	.07520811	.10736015
5	3	.025	.02863003	.03982044	.05938784
5	3	.010	.01166529	.01688744	.02631561
5	3	.005	.00589617	.00873516	.01395842
4	4	.250	.26670952	.31485113	.38877831
4	4	.100	.11075457	.14273398	.19493116
4	4	.050	.05666808	.07690689	.11125466
4	4	.025	.02887386	.04083606	.06180637
4	4	.010	.01177767	.01736775	.02750547
4	4	.005	.00595681	.00899833	.01462568

TABLE B-10

POWER OF TWO-SAMPLE T-TEST (TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.35558776	.40885484	.56393544	.71822695	.92318651
.16939538	.20729300	.33115562	.48170152	.76886229
.09347000	.11836906	.20561403	.32483734	.60765862
.05040597	.06551645	.12146051	.20522514	.44175642
.02169335	.02891127	.05713178	.10334215	.25873155
.01129179	.01525659	.03123706	.05873510	.16078176
.41826525	.49696864	.69988295	.85795245	.98494416
.21421043	.27493795	.46189527	.65894928	.92064630
.12300291	.16488047	.30823994	.48837828	.81502178
.06837168	.09477212	.19305365	.33468857	.66598357
.03029565	.04338817	.09634664	.18364884	.44863414
.01602334	.02336644	.05447842	.10974243	.30451498
.44746233	.53631958	.75177662	.89987542	.99346610
.23612360	.30741687	.51962061	.72631289	.95475012
.13786507	.18817778	.35746337	.55939271	.87643919
.07761882	.10991594	.22964691	.39695454	.74810600
.03482232	.05112605	.11766299	.22628883	.53405534
.01854385	.02777850	.06754660	.13833909	.37689263
.36012266	.41541969	.57516021	.73154068	.93179788
.17423169	.21473747	.34663798	.50510820	.79613748
.09743891	.12471433	.22046040	.35072159	.65019296
.05327321	.07024314	.13360978	.22893288	.49290424
.02333085	.03169635	.06500190	.12053574	.30751397
.01229227	.01698916	.03640601	.07077970	.20076099
.42957534	.51240968	.72115841	.87618371	.98925965
.22549116	.29189109	.49336535	.69766204	.94274876
.13212083	.17940883	.34043602	.53734017	.86210325
.07493677	.10573602	.22102127	.38500345	.73937315
.03405428	.04997110	.11569115	.22486105	.54031971
.01832770	.02751418	.06769459	.14076172	.39250753
.46786779	.56324352	.78448435	.92308628	.99656829
.25542217	.33591378	.56856531	.77910489	.97446320
.15310338	.21226838	.40827624	.62952358	.92480245
.08842714	.12796435	.27446979	.47222734	.83306784
.04093303	.06191154	.14923965	.29093726	.65450733
.02226665	.03456192	.08937075	.18840874	.50149291
.48009803	.57906481	.80236553	.93448312	.99766362
.26525226	.35018722	.59154799	.80154706	.98059977
.16011344	.22318803	.42999756	.65687587	.93893575
.09299702	.13549863	.29223025	.49968681	.85695516
.04329650	.06604102	.16081552	.31303287	.68752688
.02363123	.03702786	.09701484	.20490927	.53540042

TABLE B-10

POWER OF TWO-SAMPLE T-TEST (TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M	N	ALPHA	D= .2	D= .4	D= .6
7	2	.250	.26324825	.30174597	.36190621
7	2	.100	.10865263	.13443933	.17676033
7	2	.050	.05542586	.07187322	.09975849
7	2	.025	.02818711	.03799163	.05508506
7	2	.010	.01148273	.01611837	.02444908
7	2	.005	.00580574	.00835012	.01300844
6	3	.250	.26699486	.31593020	.39098460
6	3	.100	.11111983	.14418924	.19816171
6	3	.050	.05698157	.07819946	.11427961
6	3	.025	.02910533	.04181867	.06421006
6	3	.010	.01191216	.01795693	.02901609
6	3	.005	.00603986	.00936917	.01560373
5	4	.250	.26886177	.32292466	.40506804
5	4	.100	.11235257	.14904789	.20876143
5	4	.050	.05776031	.08137393	.12157600
5	4	.025	.02956569	.04375048	.06885099
5	4	.010	.01212784	.01889097	.03136910
5	4	.005	.00615757	.00988891	.01695138
7	3	.250	.26806117	.31993537	.39908317
7	3	.100	.11197012	.14755239	.20553993
7	3	.050	.05759014	.08069300	.12005569
7	3	.025	.02950650	.04351420	.06832645
7	3	.010	.01212459	.01888631	.03139165
7	3	.005	.00616529	.00992998	.01708377
6	4	.250	.27060941	.32943356	.41803845
6	4	.100	.11367599	.15426806	.22014477
6	4	.050	.05867932	.08514339	.13030235
6	4	.025	.03015714	.04626112	.07497050
6	4	.010	.01243346	.02023876	.03484486
6	4	.005	.00633544	.01069237	.01909715
5	5	.250	.27145707	.33257300	.42423503
5	5	.100	.11424438	.15650188	.22498290
5	5	.050	.05904263	.08663003	.13372627
5	5	.025	.03037440	.04718212	.07720710
5	5	.010	.01253671	.02069407	.03601672
5	5	.005	.00639236	.01094969	.01978381
7	4	.250	.27205466	.33478442	.42859202
7	4	.100	.11478677	.15864273	.22964577
7	4	.050	.05946006	.08835288	.13774021
7	4	.025	.03066587	.04843396	.08030000
7	4	.010	.01270066	.02143062	.03795908
7	4	.005	.00649284	.01141429	.02106039

TABLE B-10

POWER OF TWO-SAMPLE T-TEST (TWO-SIDED) VS. NORMAL
SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.43825493	.52414313	.73673714	.88879310	.99174922
.23437233	.30515727	.51728523	.72556566	.95594664
.13949125	.19112998	.36591391	.57438190	.89192857
.08040133	.11488771	.24419313	.42531463	.78967264
.03731037	.05572802	.13277542	.26069312	.61118768
.02038397	.03126911	.07993837	.16946195	.46729421
.48351411	.58350533	.80741478	.93767218	.99794668
.27081931	.35840172	.60520100	.81503054	.98410218
.16568747	.23207700	.44855311	.68083396	.95095182
.09767826	.14345286	.31220973	.53179068	.88470749
.04641420	.07169998	.17803978	.34781136	.74093488
.02572080	.04097204	.11046739	.23603143	.60287272
.50486625	.61053789	.83557882	.95352408	.99898555
.28866499	.38399280	.64400538	.84907484	.99058052
.17881706	.25242276	.48734139	.72543646	.96744906
.10650696	.15803952	.34577864	.58007237	.91592190
.05116248	.08009306	.20158533	.39074148	.79149608
.02853871	.04615890	.12685525	.27051609	.66144199
.49586477	.59925909	.82424977	.94747526	.99864799
.28333245	.37650302	.63338226	.84053033	.98929688
.17618240	.24851883	.48085843	.71916780	.96599238
.10560846	.15673585	.34388228	.57891510	.91688987
.05128955	.08047242	.20375617	.39658480	.80169571
.02887863	.04690801	.13020490	.27947085	.68133406
.52422987	.63454052	.85863342	.96495919	.99948946
.30776204	.41115255	.68325691	.88047170	.99490880
.19460117	.27690259	.53286875	.77433301	.98127091
.11830479	.17771389	.39091592	.64210879	.94816984
.05834093	.09303096	.23873318	.45731072	.85862502
.03316161	.05489563	.15562536	.33120136	.75368921
.53335343	.64564231	.86858855	.96941135	.99963179
.31579207	.42239944	.69855002	.89158515	.99603827
.20073945	.28629549	.54938560	.79054238	.98470171
.12258536	.18476890	.40629451	.66154595	.95587845
.06074815	.09732798	.25053316	.47693473	.87415152
.03463498	.05765768	.16436772	.34843627	.77470470
.53974789	.65338370	.87536911	.97231948	.99971222
.32357257	.43333771	.71338557	.90211591	.99699235
.20802057	.29755043	.56941837	.80999682	.98845272
.12861115	.19486081	.42886974	.69013464	.96643206
.06483980	.10480333	.27196053	.51321131	.90165210
.03745830	.06310185	.18257307	.38540155	.81886225

TABLE B-10

POWER OF TWO-SAMPLE T-TEST (TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M	N	ALPHA	D= .2	D= .4	D= .6
6	5	.250	.27360765	.34049797	.43973911
6	5	.100	.11584004	.16277510	.23855497
6	5	.050	.06013936	.09113915	.14416364
6	5	.025	.03107570	.05018284	.08457494
6	5	.010	.01289764	.02230991	.04025338
6	5	.005	.00660231	.01191731	.02242830
7	5	.250	.27541683	.34711570	.45251961
7	5	.100	.11720105	.16811513	.25004657
7	5	.050	.06108514	.09503697	.15319049
7	5	.025	.03168720	.05281733	.09108408
7	5	.010	.01321692	.02375755	.04410095
7	5	.005	.00679002	.01279719	.02487880
6	6	.250	.27613161	.34971652	.45749676
6	6	.100	.11769100	.17003148	.25414516
6	6	.050	.06140376	.09634781	.15621293
6	6	.025	.03188101	.05365185	.09313997
6	6	.010	.01331106	.02418473	.04523492
6	6	.005	.00684274	.01304474	.02556815
7	6	.250	.27828387	.35750854	.47227676
7	6	.100	.11928963	.17628307	.26748748
7	6	.050	.06250683	.10090313	.16674892
7	6	.025	.03259066	.05673158	.10078990
7	6	.010	.01368015	.02588177	.04980676
7	6	.005	.00705945	.01407981	.02850709
7	7	.250	.28075620	.36638034	.48884518
7	7	.100	.12111207	.18338897	.28254036
7	7	.050	.06375890	.10608241	.17870883
7	7	.025	.03339374	.06023846	.10953546
7	7	.010	.01409688	.02782105	.05508859
7	7	.005	.00730397	.01526690	.03193166

TABLE B-10

POWER OF TWO-SAMPLE T-TEST (TWO-SIDED) VS. NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

D= .8	D= 1.0	D= 1.5	D= 2.0	D= 3.0
.55588145	.67256385	.89111834	.97847941	.99984298
.33822422	.45354888	.73901568	.91865024	.99813049
.21949991	.31495463	.59835988	.83553077	.99219170
.13681564	.20833809	.45705356	.72261040	.97558552
.06960208	.11334147	.29489630	.54869391	.92246954
.04044066	.06874906	.20031854	.41846809	.84984569
.57410017	.69377613	.90719828	.98404201	.99992394
.35701713	.47919372	.76980010	.93666075	.99902728
.23565414	.33935540	.63745565	.86738574	.99570132
.14940831	.22908458	.49956647	.76865383	.98573035
.07771823	.12805567	.33445155	.60750507	.95078591
.04590103	.07926478	.23388572	.47955220	.89850179
.58110081	.70178143	.91287059	.98581354	.99994270
.36365237	.48811549	.77988823	.94202905	.99922482
.24101843	.34735370	.64958148	.87641777	.99644610
.15335893	.23551925	.51209553	.78112332	.98781637
.08009833	.13232952	.34542847	.62261149	.95642705
.04743125	.08218745	.24283605	.49471350	.90803074
.60161605	.72481843	.92810303	.99009868	.99997599
.38512993	.51669410	.81060859	.95701481	.99964305
.25971592	.37509578	.69010757	.90445793	.99824563
.16813642	.25959861	.55787240	.82400739	.99354849
.08980980	.14989288	.39022464	.68165527	.97467291
.05406556	.09501134	.28232127	.55960388	.94268891
.62408846	.74927156	.94245979	.99347392	.99999122
.40901749	.54776556	.84087209	.96958162	.99985372
.28076627	.40580695	.73133032	.92907027	.99921992
.18498683	.28674681	.60594941	.86341902	.99689301
.10107964	.17018713	.43931691	.73936681	.98647538
.06187009	.11010967	.32701157	.62608092	.96698300

TABLES C - 1 and C - 2

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER
NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 1	N = 1		
2	1	0.500000	0.556232	0.611351	0.664313	0.714196
1	2	0.500000	0.443769	0.388649	0.335687	0.285804
			M = 2	N = 1		
3	3	0.333333	0.391392	0.451875	0.513387	0.574469
2	4	0.333333	0.329678	0.318953	0.301853	0.279454
1	5	0.333333	0.278930	0.229172	0.184760	0.146077
			M = 3	N = 1		
4	6	0.250000	0.304081	0.362696	0.424579	0.488231
3	7	0.250000	0.261934	0.267537	0.266425	0.258715
2	8	0.250000	0.232584	0.210892	0.186355	0.160466
1	9	0.250000	0.201402	0.158875	0.122642	0.092588
			M = 2	N = 2		
7	3	0.166667	0.214500	0.269184	0.329757	0.394803
6	4	0.166667	0.189787	0.209134	0.223110	0.230547
5	5	0.333333	0.327996	0.312497	0.288298	0.257573
4	6	0.166667	0.141573	0.116275	0.092299	0.070788
3	7	0.166667	0.126144	0.092910	0.066536	0.046290
			M = 4	N = 1		
5	10	0.200000	0.249631	0.305001	0.365088	0.428526
4	11	0.200000	0.217800	0.230777	0.237961	0.238821
3	12	0.200000	0.197168	0.188909	0.175908	0.159198
2	13	0.200000	0.178666	0.155250	0.131202	0.107823
1	14	0.200000	0.156735	0.120062	0.089841	0.065633
			M = 3	N = 2		
9	6	0.100000	0.137155	0.182463	0.235740	0.296192
8	7	0.100000	0.123775	0.147460	0.169192	0.187078
7	8	0.200000	0.220229	0.233070	0.237143	0.232068
6	9	0.200000	0.195974	0.184383	0.166582	0.144540
5	10	0.200000	0.174510	0.146264	0.117729	0.090989
4	11	0.100000	0.077719	0.058075	0.041702	0.028764
3	12	0.100000	0.070636	0.048286	0.031911	0.020369

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER
NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 1	N = 1		
2	1	0.760250	0.855578	0.921350	0.983053
1	2	0.239750	0.144422	0.078650	0.016947
		M = 2	N = 1		
3	3	0.633702	0.765812	0.865767	0.968796
2	4	0.253096	0.179532	0.111166	0.028514
1	5	0.113202	0.054656	0.023066	0.002690
		M = 3	N = 1		
4	6	0.552031	0.701863	0.822793	0.956374
3	7	0.245012	0.191848	0.128923	0.037263
2	8	0.134632	0.077450	0.037827	0.005508
1	9	0.068325	0.028840	0.010457	0.000854
		M = 2	N = 2		
7	3	0.462546	0.630691	0.774916	0.942866
6	4	0.230869	0.202646	0.147942	0.047053
5	5	0.222888	0.135194	0.067523	0.009613
4	6	0.052434	0.021223	0.006869	0.000363
3	7	0.031263	0.010246	0.002751	0.000106
		M = 4	N = 1		
5	10	0.493699	0.652865	0.787839	0.945311
4	11	0.233330	0.195992	0.139816	0.044252
3	12	0.140028	0.089708	0.048122	0.008148
2	13	0.086157	0.043461	0.018355	0.001912
1	14	0.046786	0.017974	0.005869	0.000376
		M = 3	N = 2		
9	6	0.362428	0.540138	0.707166	0.920514
8	7	0.199476	0.200693	0.163485	0.060500
7	8	0.218516	0.159333	0.092361	0.016232
6	9	0.120473	0.064209	0.026832	0.002350
5	10	0.067513	0.026772	0.008221	0.000362
4	11	0.019048	0.005674	0.001300	0.000030
3	12	0.012547	0.003181	0.000636	0.000012

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 5	N = 1		
6	15	0.166667	0.212274	0.264317	0.322024	0.384213
5	16	0.166667	0.186786	0.203423	0.215323	0.221563
4	17	0.166667	0.170927	0.170096	0.164256	0.153926
3	18	0.166667	0.157686	0.144752	0.128924	0.111405
2	19	0.166667	0.144490	0.121687	0.099540	0.079076
1	20	0.166667	0.127837	0.095725	0.069933	0.049817
			M = 4	N = 2		
11	10	0.066667	0.095962	0.133481	0.179661	0.234328
10	11	0.066667	0.087565	0.110314	0.133384	0.154900
9	12	0.133333	0.157869	0.178929	0.194213	0.201977
8	13	0.133333	0.144922	0.150405	0.149101	0.141247
7	14	0.200000	0.195485	0.182548	0.162877	0.138877
6	15	0.133333	0.117092	0.098124	0.078445	0.059814
5	16	0.133333	0.107754	0.083297	0.061572	0.043510
4	17	0.066667	0.048651	0.034011	0.022764	0.014580
3	18	0.066667	0.044700	0.028892	0.017983	0.010768
			M = 3	N = 3		
15	6	0.050000	0.074789	0.107703	0.149556	0.200574
14	7	0.050000	0.068751	0.090330	0.113497	0.136494
13	8	0.100000	0.125699	0.150444	0.171565	0.186555
12	9	0.150000	0.168427	0.179984	0.183103	0.177401
11	10	0.150000	0.154398	0.150814	0.139822	0.123064
10	11	0.150000	0.138272	0.120929	0.100336	0.078977
9	12	0.150000	0.127107	0.102464	0.078568	0.057302
8	13	0.100000	0.075702	0.054499	0.037291	0.024240
7	14	0.050000	0.034719	0.023000	0.014527	0.008742
6	15	0.050000	0.032137	0.019832	0.011735	0.006651
			M = 6	N = 1		
7	21	0.142857	0.184978	0.233936	0.289188	0.349745
6	22	0.142857	0.163773	0.182284	0.197013	0.206810
5	23	0.142857	0.150926	0.154560	0.153435	0.147665
4	24	0.142857	0.140619	0.134113	0.123932	0.110964
3	25	0.142857	0.131064	0.116544	0.100437	0.083884
2	26	0.142857	0.120962	0.099406	0.079274	0.061338
1	27	0.142857	0.107677	0.079157	0.056721	0.039594

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 5 N = 1			
6	15	0.449365	0.613555	0.758452	0.935305
5	16	0.221670	0.196550	0.146937	0.050033
4	17	0.139986	0.096879	0.055666	0.010564
3	18	0.093394	0.052634	0.024537	0.003016
2	19	0.060999	0.028010	0.010675	0.000882
1	20	0.034586	0.012373	0.003734	0.000200
		M = 4 N = 2			
11	10	0.296621	0.474302	0.653768	0.900794
10	11	0.172903	0.192397	0.170196	0.070838
9	12	0.201361	0.166749	0.107524	0.022154
8	13	0.127927	0.082344	0.040576	0.004671
7	14	0.113185	0.055822	0.020947	0.001362
6	15	0.043491	0.015908	0.004310	0.000128
5	16	0.029385	0.009024	0.002081	0.000047
4	17	0.008931	0.002152	0.000389	0.000005
3	18	0.006197	0.001302	0.000210	0.000002
		M = 3 N = 3			
15	6	0.260249	0.437210	0.623570	0.889891
14	7	0.157260	0.186915	0.173690	0.076735
13	8	0.193571	0.173896	0.118829	0.026020
12	9	0.163762	0.108896	0.054263	0.006009
11	10	0.102855	0.052494	0.019547	0.001088
10	11	0.058976	0.022583	0.006238	0.000182
9	12	0.039752	0.012807	0.003027	0.000068
8	13	0.014960	0.003558	0.000607	0.000006
7	14	0.005009	0.001001	0.000146	0.000001
6	15	0.003607	0.000640	0.000084	0.000001
		M = 6 N = 1			
7	21	0.414216	0.580994	0.733157	0.926149
6	22	0.210892	0.195367	0.151768	0.054933
5	23	0.137779	0.101232	0.061392	0.012766
4	24	0.096266	0.058783	0.029475	0.004108
3	25	0.067892	0.034864	0.014699	0.001443
2	26	0.046042	0.019666	0.006931	0.000481
1	27	0.026912	0.009095	0.002578	0.000120

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 5	N = 2		
13	15	0.047619	0.071249	0.102726	0.142921	0.192163
12	16	0.047619	0.065486	0.086156	0.108518	0.130955
11	17	0.095238	0.119012	0.141968	0.161746	0.176096
10	18	0.095238	0.110759	0.122633	0.129326	0.129967
9	19	0.142857	0.152473	0.154826	0.149624	0.137667
8	20	0.142857	0.139326	0.129253	0.114072	0.095791
7	21	0.142857	0.127308	0.107884	0.086920	0.066571
6	22	0.095238	0.077934	0.060669	0.044916	0.031615
5	23	0.095238	0.072721	0.052960	0.036772	0.024334
4	24	0.047619	0.033104	0.021988	0.013945	0.008440
3	25	0.047619	0.030629	0.018937	0.011241	0.006400
			M = 4	N = 3		
18	10	0.028571	0.045723	0.070060	0.102964	0.145400
17	11	0.028571	0.042465	0.059996	0.080658	0.103288
16	12	0.057143	0.078586	0.102337	0.126297	0.147841
15	13	0.085714	0.107456	0.127359	0.142786	0.151519
14	14	0.114286	0.131976	0.143798	0.147881	0.143599
13	15	0.114286	0.120729	0.120026	0.112320	0.098958
12	16	0.142857	0.138665	0.126818	0.109290	0.088766
11	17	0.114286	0.101802	0.085321	0.067279	0.049913
10	18	0.114286	0.093351	0.071910	0.052233	0.035773
9	19	0.085714	0.064608	0.045999	0.030922	0.019621
8	20	0.057143	0.039315	0.025574	0.015718	0.009122
7	21	0.028571	0.018257	0.011069	0.006363	0.003465
6	22	0.028571	0.017068	0.009732	0.005290	0.002737
			M = 7	N = 1		
8	28	0.125000	0.164122	0.210302	0.263200	0.322010
7	29	0.125000	0.145995	0.165437	0.181915	0.194147
6	30	0.125000	0.135220	0.141683	0.143803	0.141391
5	31	0.125000	0.126794	0.124502	0.118345	0.108900
4	32	0.125000	0.119289	0.110196	0.098536	0.085288
3	33	0.125000	0.111917	0.097044	0.081490	0.066264
2	34	0.125000	0.103817	0.083626	0.065323	0.049473
1	35	0.125000	0.092846	0.067211	0.047389	0.032527

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 5	N = 2		
13	15	0.250091	0.423869	0.610114	0.883110
12	16	0.151531	0.182621	0.172590	0.079085
11	17	0.183316	0.167306	0.117172	0.027398
10	18	0.124534	0.091251	0.050425	0.007022
9	19	0.120648	0.070361	0.030696	0.002603
8	20	0.076560	0.035313	0.012099	0.000623
7	21	0.048462	0.017541	0.004619	0.000124
6	22	0.021152	0.006193	0.001315	0.000022
5	23	0.015343	0.003913	0.000734	0.000010
4	24	0.004872	0.001000	0.000151	0.000001
3	25	0.003492	0.000633	0.000087	0.000001
		M = 4	N = 3		
18	10	0.197668	0.365664	0.559449	0.863100
17	11	0.126125	0.170058	0.174823	0.088778
16	12	0.164302	0.171567	0.132507	0.034504
15	13	0.152291	0.122264	0.071260	0.009973
14	14	0.131730	0.083104	0.037292	0.002884
13	15	0.082104	0.039667	0.013268	0.000508
12	16	0.067963	0.026986	0.007475	0.000203
11	17	0.034839	0.010867	0.002322	0.000035
10	18	0.023100	0.005989	0.001080	0.000012
9	19	0.011750	0.002527	0.000377	0.000003
8	20	0.004996	0.000857	0.000101	0.000000
7	21	0.001786	0.000267	0.000028	0.000000
6	22	0.001347	0.000182	0.000018	0.000000
		M = 7	N = 1		
8	28	0.385481	0.553379	0.710998	0.917697
7	29	0.201146	0.193299	0.155111	0.059164
6	30	0.134684	0.103888	0.065854	0.014775
5	31	0.097011	0.063061	0.033491	0.005162
4	32	0.071455	0.039809	0.018090	0.002027
3	33	0.052176	0.024924	0.009725	0.000805
2	34	0.036324	0.014636	0.004844	0.000292
1	35	0.021723	0.007004	0.001886	0.000078

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER
NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 6	N = 2		
15	21	0.035714	0.055182	0.081977	0.117259	0.161741
14	22	0.035714	0.050982	0.069485	0.090490	0.112690
13	23	0.071429	0.093165	0.115758	0.137088	0.154831
12	24	0.071429	0.087403	0.101613	0.112293	0.118022
11	25	0.107143	0.121476	0.130734	0.133605	0.129716
10	26	0.107143	0.113533	0.114049	0.108652	0.098209
9	27	0.142857	0.139118	0.128481	0.112544	0.093519
8	28	0.107143	0.095824	0.081197	0.065171	0.049538
7	29	0.107143	0.089673	0.071197	0.053611	0.038279
6	30	0.071429	0.055436	0.040843	0.028556	0.018940
5	31	0.071429	0.052143	0.036225	0.023941	0.015046
4	32	0.035714	0.023871	0.015213	0.009238	0.005343
3	33	0.035714	0.022195	0.013229	0.007553	0.004127
			M = 5	N = 3		
21	15	0.017857	0.030196	0.048680	0.074959	0.110459
20	16	0.017857	0.028231	0.042258	0.059959	0.080736
19	17	0.035714	0.052625	0.073129	0.095927	0.118897
18	18	0.053571	0.072648	0.092754	0.111568	0.126522
17	19	0.071429	0.090832	0.108419	0.121542	0.128053
16	20	0.089286	0.104337	0.114304	0.117436	0.113201
15	21	0.107143	0.116388	0.118376	0.112754	0.100611
14	22	0.107143	0.107153	0.100239	0.087718	0.071812
13	23	0.107143	0.100212	0.087681	0.071775	0.054982
12	24	0.107143	0.092331	0.074475	0.056224	0.039727
11	25	0.089286	0.071609	0.053815	0.037890	0.024993
10	26	0.071429	0.052695	0.036451	0.023633	0.014355
9	27	0.053571	0.037170	0.024254	0.014876	0.008573
8	28	0.035714	0.022839	0.013750	0.007788	0.004147
7	29	0.017857	0.010684	0.006040	0.003223	0.001622
6	30	0.017857	0.010051	0.005376	0.002728	0.001312

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 6 N = 2			
15	21	0.215490	0.383789	0.573483	0.867059
14	22	0.134309	0.172905	0.172676	0.085839
13	23	0.166876	0.164753	0.123426	0.032050
12	24	0.118045	0.095505	0.057634	0.009296
11	25	0.119707	0.078756	0.038329	0.003937
10	26	0.084269	0.045969	0.018427	0.001275
9	27	0.073739	0.032442	0.010399	0.000443
8	28	0.035655	0.012332	0.003026	0.000065
7	29	0.025911	0.007729	0.001648	0.000027
6	30	0.011914	0.002960	0.000525	0.000006
5	31	0.008989	0.001983	0.000317	0.000003
4	32	0.002941	0.000531	0.000070	0.000000
3	33	0.002155	0.000347	0.000041	0.000000
		M = 5 N = 3			
21	15	0.156094	0.313006	0.508295	0.839260
20	16	0.103292	0.154183	0.172086	0.098057
19	17	0.139388	0.163787	0.139430	0.041818
18	18	0.135381	0.125093	0.082164	0.013837
17	19	0.126887	0.095358	0.049859	0.004997
16	20	0.102429	0.060747	0.024669	0.001418
15	21	0.084131	0.040609	0.013210	0.000448
14	22	0.055009	0.021155	0.005405	0.000107
13	23	0.039423	0.012883	0.002814	0.000042
12	24	0.026273	0.007004	0.001241	0.000012
11	25	0.015444	0.003488	0.000527	0.000004
10	26	0.008167	0.001494	0.000180	0.000001
9	27	0.004640	0.000759	0.000083	0.000000
8	28	0.002074	0.000278	0.000025	0.000000
7	29	0.000770	0.000092	0.000007	0.000000
6	30	0.000597	0.000065	0.000005	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 4	N = 4		
26	10	0.014286	0.024869	0.041163	0.064905	0.097699
25	11	0.014286	0.023323	0.035956	0.052411	0.072321
24	12	0.028571	0.043663	0.062746	0.084880	0.108203
23	13	0.042857	0.060859	0.081022	0.101216	0.118758
22	14	0.071429	0.093131	0.113749	0.130214	0.139789
21	15	0.071429	0.086832	0.098506	0.104324	0.103185
20	16	0.100000	0.112807	0.118671	0.116465	0.106676
19	17	0.100000	0.103950	0.100668	0.090835	0.076382
18	18	0.114286	0.110316	0.099217	0.083156	0.064959
17	19	0.100000	0.089617	0.074815	0.058187	0.042164
16	20	0.100000	0.082643	0.063657	0.045691	0.030556
15	21	0.071429	0.054818	0.039239	0.026192	0.016302
14	22	0.071429	0.051298	0.034485	0.021694	0.012768
13	23	0.042857	0.028271	0.017456	0.010081	0.005442
12	24	0.028571	0.017564	0.010134	0.005483	0.002780
11	25	0.014286	0.008253	0.004492	0.002301	0.001108
10	26	0.014286	0.007788	0.004022	0.001965	0.000907
			M = 7	N = 2		
17	28	0.027778	0.044111	0.067228	0.098476	0.138857
16	29	0.027778	0.040913	0.057444	0.076944	0.098403
15	30	0.055556	0.075075	0.096485	0.117997	0.137404
14	31	0.055556	0.070812	0.085617	0.098247	0.107060
13	32	0.083333	0.099000	0.111455	0.118960	0.120433
12	33	0.083333	0.093503	0.099283	0.099808	0.095041
11	34	0.111111	0.116378	0.115294	0.108070	0.095885
10	35	0.111111	0.108057	0.099394	0.086482	0.071194
9	36	0.111111	0.100310	0.085610	0.069060	0.052649
8	37	0.083333	0.070258	0.056015	0.042221	0.030079
7	38	0.083333	0.066449	0.050177	0.035871	0.024272
6	39	0.055556	0.041327	0.029136	0.019461	0.012310
5	40	0.055556	0.039078	0.026115	0.016573	0.009984
4	41	0.027778	0.017965	0.011060	0.006478	0.003607
3	42	0.027778	0.016766	0.009687	0.005352	0.002824

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 4	N = 4		
26	10	0.140698	0.293083	0.488831	0.830374
25	11	0.094603	0.147899	0.170905	0.101638
24	12	0.130133	0.161295	0.142901	0.044923
23	13	0.131004	0.128746	0.088282	0.015461
22	14	0.140827	0.109194	0.058024	0.005714
21	15	0.095357	0.058366	0.023663	0.001184
20	16	0.091238	0.045913	0.015276	0.000519
19	17	0.059871	0.024000	0.006254	0.000121
18	18	0.047310	0.015802	0.003444	0.000048
17	19	0.028472	0.007849	0.001403	0.000013
16	20	0.019038	0.004278	0.000618	0.000004
15	21	0.009460	0.001786	0.000218	0.000001
14	22	0.007030	0.001181	0.000131	0.000001
13	23	0.002744	0.000366	0.000032	0.000000
12	24	0.001320	0.000153	0.000012	0.000000
11	25	0.000501	0.000052	0.000004	0.000000
10	26	0.000394	0.000038	0.000002	0.000000
		M = 7	N = 2		
17	28	0.188786	0.351054	0.542131	0.852351
16	29	0.120258	0.163760	0.171465	0.091479
15	30	0.152450	0.160758	0.127477	0.036196
14	31	0.110855	0.097180	0.062996	0.011452
13	32	0.115712	0.083657	0.044358	0.005291
12	33	0.085780	0.052762	0.023658	0.002009
11	34	0.080565	0.041258	0.015289	0.000868
10	35	0.055467	0.023424	0.007104	0.000263
9	36	0.037928	0.013034	0.003141	0.000063
8	37	0.020249	0.005871	0.001191	0.000017
7	38	0.015541	0.004000	0.000727	0.000008
6	39	0.007373	0.001608	0.000248	0.000002
5	40	0.005707	0.001118	0.000157	0.000001
4	41	0.001908	0.000310	0.000036	0.000000
3	42	0.001422	0.000207	0.000022	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 6	N = 3		
24	21	0.011905	0.021086	0.035484	0.056842	0.086853
23	22	0.011905	0.019807	0.031103	0.046155	0.064803
22	23	0.023810	0.037105	0.054362	0.074949	0.097341
21	24	0.035714	0.051529	0.069775	0.088737	0.106078
20	25	0.047619	0.064994	0.082993	0.099217	0.111131
19	26	0.059524	0.075763	0.090050	0.100006	0.103844
18	27	0.083333	0.098790	0.109306	0.112921	0.108969
17	28	0.083333	0.092090	0.094753	0.090795	0.081046
16	29	0.095238	0.098303	0.094494	0.084605	0.070573
15	30	0.095238	0.091869	0.082463	0.068885	0.053558
14	31	0.095238	0.085923	0.072186	0.056477	0.041157
13	32	0.083333	0.070200	0.055045	0.040172	0.027287
12	33	0.083333	0.065590	0.048159	0.032982	0.021068
11	34	0.059524	0.043646	0.029855	0.019043	0.011322
10	35	0.047619	0.032620	0.020881	0.012484	0.006967
9	36	0.035714	0.023215	0.014143	0.008072	0.004313
8	37	0.023810	0.014349	0.008115	0.004303	0.002137
7	38	0.011905	0.006746	0.003600	0.001807	0.000853
6	39	0.011905	0.006375	0.003232	0.001549	0.000701
			M = 5	N = 4		
30	15	0.007937	0.014813	0.026139	0.043704	0.069392
29	16	0.007937	0.013979	0.023130	0.036000	0.052785
28	17	0.015873	0.026351	0.040920	0.059509	0.081151
27	18	0.023810	0.037058	0.053780	0.072846	0.092197
26	19	0.039683	0.057460	0.077453	0.097260	0.113875
25	20	0.047619	0.064363	0.080780	0.094191	0.102094
24	21	0.063492	0.080584	0.094756	0.103280	0.104401
23	22	0.071429	0.084314	0.092052	0.092986	0.086941
22	23	0.087302	0.096151	0.097934	0.092270	0.080441
21	24	0.087302	0.090064	0.085814	0.075532	0.061433
20	25	0.095238	0.091525	0.081233	0.066596	0.050437
19	26	0.087302	0.078146	0.064591	0.049295	0.034740
18	27	0.087302	0.073294	0.056894	0.040833	0.027099
17	28	0.071429	0.055955	0.040522	0.027125	0.016781
16	29	0.063492	0.046328	0.031294	0.019563	0.011316
15	30	0.047619	0.032700	0.020835	0.012314	0.006749
14	31	0.039683	0.025494	0.015227	0.008451	0.004356
13	32	0.023810	0.014249	0.007936	0.004110	0.001977
12	33	0.015873	0.008934	0.004693	0.002298	0.001049
11	34	0.007937	0.004227	0.002109	0.000985	0.000430
10	35	0.007937	0.004012	0.001910	0.000855	0.000359

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 6 N = 3			
24	21	0.126858	0.272644	0.466314	0.817773
23	22	0.086198	0.140119	0.167630	0.105397
22	23	0.119228	0.154404	0.142511	0.048149
21	24	0.119302	0.123347	0.089203	0.017472
20	25	0.116722	0.100229	0.058939	0.007202
19	26	0.100896	0.070618	0.033377	0.002551
18	27	0.098281	0.056742	0.021858	0.001053
17	28	0.067415	0.031322	0.009457	0.000247
16	29	0.054861	0.021530	0.005499	0.000104
15	30	0.038766	0.012662	0.002667	0.000033
14	31	0.027942	0.007804	0.001415	0.000014
13	32	0.017251	0.004009	0.000597	0.000004
12	33	0.012553	0.002539	0.000334	0.000002
11	34	0.006272	0.001050	0.000112	0.000000
10	35	0.003629	0.000524	0.000049	0.000000
9	36	0.002157	0.000285	0.000025	0.000000
8	37	0.000994	0.000109	0.000008	0.000000
7	38	0.000378	0.000037	0.000002	0.000000
6	39	0.000299	0.000027	0.000002	0.000000
		M = 5 N = 4			
30	15	0.104882	0.241526	0.433710	0.801454
29	16	0.073027	0.128844	0.163926	0.111206
28	17	0.103906	0.147663	0.146152	0.053689
27	18	0.109160	0.125409	0.097812	0.020659
26	19	0.124426	0.115552	0.071425	0.008867
25	20	0.102937	0.076963	0.037330	0.002608
24	21	0.097938	0.060485	0.023827	0.001027
23	22	0.075273	0.037637	0.011790	0.000300
22	23	0.064917	0.027190	0.007129	0.000129
21	24	0.046186	0.016094	0.003472	0.000041
20	25	0.035298	0.010262	0.001840	0.000015
19	26	0.022610	0.005462	0.000807	0.000004
18	27	0.016633	0.003495	0.000455	0.000002
17	28	0.009594	0.001679	0.000180	0.000001
16	29	0.006055	0.000902	0.000083	0.000000
15	30	0.003430	0.000454	0.000038	0.000000
14	31	0.002084	0.000238	0.000017	0.000000
13	32	0.000883	0.000085	0.000005	0.000000
12	33	0.000445	0.000038	0.000002	0.000000
11	34	0.000175	0.000014	0.000001	0.000000
10	35	0.000141	0.000010	0.000001	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 3

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
27	28	0.008333	0.015361	0.026826	0.044469	0.070121
26	29	0.008333	0.014481	0.023688	0.036523	0.053148
25	30	0.016667	0.027228	0.041707	0.059968	0.081026
24	31	0.025000	0.037970	0.053983	0.071902	0.089800
23	32	0.033333	0.048156	0.064921	0.081739	0.096190
22	33	0.041667	0.056552	0.071493	0.084243	0.092597
21	34	0.058333	0.074533	0.088604	0.098058	0.101091
20	35	0.066667	0.079767	0.088670	0.091611	0.088011
19	36	0.075000	0.084490	0.088306	0.085653	0.077129
18	37	0.083333	0.087660	0.085517	0.077380	0.064954
17	38	0.083333	0.082941	0.076525	0.065463	0.051936
16	39	0.083333	0.077606	0.066986	0.053591	0.039743
15	40	0.083333	0.073467	0.060066	0.045548	0.032041
14	41	0.075000	0.061752	0.047152	0.033386	0.021918
13	42	0.066667	0.051749	0.037300	0.024960	0.015506
12	43	0.058333	0.042457	0.028725	0.018059	0.010546
11	44	0.041667	0.028577	0.018235	0.010819	0.005967
10	45	0.033333	0.021517	0.012944	0.007253	0.003784
9	46	0.025000	0.015397	0.008863	0.004766	0.002393
8	47	0.016667	0.009557	0.005128	0.002573	0.001206
7	48	0.008333	0.004509	0.002291	0.001092	0.000488
6	49	0.008333	0.004275	0.002070	0.000945	0.000406

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 7		N = 3	
27	28	0.105411	0.240750	0.431112	0.798214
26	29	0.073094	0.127869	0.162450	0.111315
25	30	0.102997	0.144882	0.143298	0.053665
24	31	0.105267	0.119530	0.093699	0.020844
23	32	0.105899	0.101305	0.065530	0.009394
22	33	0.095023	0.075563	0.040131	0.003790
21	34	0.097156	0.065111	0.028806	0.001815
20	35	0.078670	0.043560	0.015674	0.000620
19	36	0.064505	0.029964	0.008886	0.000215
18	37	0.050594	0.019577	0.004793	0.000076
17	38	0.038227	0.012838	0.002733	0.000034
16	39	0.027325	0.007707	0.001366	0.000011
15	40	0.020915	0.005204	0.000821	0.000006
14	41	0.013342	0.002773	0.000361	0.000002
13	42	0.008942	0.001633	0.000189	0.000001
12	43	0.005720	0.000896	0.000088	0.000000
11	44	0.003057	0.000416	0.000035	0.000000
10	45	0.001837	0.000219	0.000017	0.000000
9	46	0.001121	0.000124	0.000009	0.000000
8	47	0.000528	0.000049	0.000003	0.000000
7	48	0.000204	0.000017	0.000001	0.000000
6	49	0.000164	0.000013	0.000001	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 6 N = 4

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
34	21	0.004762	0.009430	0.017576	0.030897	0.051356
33	22	0.004762	0.008939	0.015695	0.025815	0.039839
32	23	0.009524	0.016929	0.028029	0.043280	0.062415
31	24	0.014286	0.023940	0.037245	0.053859	0.072481
30	25	0.023810	0.037367	0.054356	0.073350	0.091912
29	26	0.028571	0.042407	0.058152	0.073733	0.086516
28	27	0.042857	0.059663	0.076641	0.090897	0.099602
27	28	0.047619	0.062335	0.075099	0.083307	0.085133
26	29	0.061905	0.076020	0.085853	0.089202	0.085308
25	30	0.066667	0.076974	0.081638	0.079553	0.071252
24	31	0.076191	0.082770	0.082518	0.075517	0.063462
23	32	0.076191	0.077654	0.072581	0.062223	0.048940
22	33	0.085714	0.082107	0.072172	0.058223	0.043117
21	34	0.076191	0.068548	0.056549	0.042776	0.029673
20	35	0.076191	0.064348	0.049857	0.035435	0.023103
19	36	0.066667	0.053027	0.038732	0.025978	0.016001
18	37	0.061905	0.046346	0.031892	0.020167	0.011719
17	38	0.047619	0.033466	0.021629	0.012853	0.007020
16	39	0.042857	0.028391	0.017338	0.009756	0.005058
15	40	0.028571	0.017772	0.010200	0.005398	0.002632
14	41	0.023810	0.014050	0.007672	0.003875	0.001809
13	42	0.014286	0.007906	0.004053	0.001923	0.000844
12	43	0.009524	0.004984	0.002423	0.001094	0.000458
11	44	0.004762	0.002369	0.001099	0.000475	0.000191
10	45	0.004762	0.002258	0.001003	0.000417	0.000162

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 6 N = 4

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
34	21	0.080922	0.203266	0.389369	0.775557
33	22	0.057786	0.112954	0.155984	0.118504
32	23	0.084185	0.134098	0.145671	0.061104
31	24	0.090893	0.118623	0.102880	0.025440
30	25	0.107059	0.114767	0.080160	0.012056
29	26	0.094031	0.083420	0.047064	0.004300
28	27	0.100916	0.074461	0.034439	0.002002
27	28	0.080196	0.048580	0.017980	0.000599
26	29	0.075134	0.038315	0.011876	0.000276
25	30	0.058681	0.025112	0.006452	0.000098
24	31	0.048995	0.017773	0.003852	0.000042
23	32	0.035326	0.010771	0.001942	0.000014
22	33	0.029321	0.007725	0.001211	0.000007
21	34	0.018879	0.004183	0.000544	0.000002
20	35	0.013818	0.002625	0.000293	0.000001
19	36	0.009052	0.001505	0.000148	0.000000
18	37	0.006257	0.000901	0.000077	0.000000
17	38	0.003524	0.000435	0.000032	0.000000
16	39	0.002415	0.000265	0.000017	0.000000
15	40	0.001183	0.000111	0.000006	0.000000
14	41	0.000780	0.000067	0.000004	0.000000
13	42	0.000342	0.000025	0.000001	0.000000
12	43	0.000177	0.000012	0.000001	0.000000
11	44	0.000071	0.000004	0.000000	0.000000
10	45	0.000059	0.000003	0.000000	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER
NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 5	N = 5		
40	15	0.003968	0.008045	0.015315	0.027442	0.046404
39	16	0.003968	0.007638	0.013721	0.023042	0.036239
38	17	0.007937	0.014493	0.024596	0.038851	0.057201
37	18	0.011905	0.020557	0.032879	0.048766	0.067167
36	19	0.019841	0.032277	0.048504	0.067406	0.086729
35	20	0.027778	0.042041	0.058710	0.075703	0.090200
34	21	0.035714	0.051364	0.067937	0.082695	0.092699
33	22	0.043651	0.058799	0.072698	0.082538	0.086102
32	23	0.055556	0.070461	0.081922	0.087356	0.085477
31	24	0.063492	0.075428	0.082066	0.081799	0.074722
30	25	0.071429	0.079912	0.081799	0.076629	0.065719
29	26	0.075397	0.079052	0.075754	0.066361	0.053154
28	27	0.079365	0.078440	0.070865	0.058533	0.044215
27	28	0.079365	0.073394	0.062032	0.047918	0.033835
26	29	0.075397	0.065716	0.052343	0.038098	0.025343
25	30	0.071429	0.058407	0.043688	0.029893	0.018712
24	31	0.063492	0.048936	0.034529	0.022303	0.013187
23	32	0.055556	0.040138	0.026564	0.016100	0.008934
22	33	0.043651	0.029730	0.018570	0.010634	0.005582
21	34	0.035714	0.022826	0.013402	0.007226	0.003577
20	35	0.027778	0.016925	0.009506	0.004918	0.002344
19	36	0.019841	0.011256	0.005887	0.002836	0.001257
18	37	0.011905	0.006378	0.003158	0.001443	0.000608
17	38	0.007937	0.004034	0.001901	0.000829	0.000334
16	39	0.003968	0.001921	0.000865	0.000362	0.000141
15	40	0.003968	0.001834	0.000792	0.000319	0.000120

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 5	N = 5		
40	15	0.074246	0.192358	0.376638	0.768260
39	16	0.053473	0.108316	0.153633	0.120644
38	17	0.078621	0.130288	0.145828	0.063450
37	18	0.086023	0.117323	0.105145	0.026970
36	19	0.103441	0.116345	0.084043	0.013017
35	20	0.099395	0.090588	0.051887	0.004667
34	21	0.095772	0.073140	0.034260	0.001877
33	22	0.082578	0.051738	0.019499	0.000644
32	23	0.076797	0.040650	0.012856	0.000297
31	24	0.062586	0.027598	0.007183	0.000107
30	25	0.051620	0.019284	0.004219	0.000044
29	26	0.038941	0.012142	0.002192	0.000015
28	27	0.030556	0.008248	0.001294	0.000007
27	28	0.021843	0.004950	0.000646	0.000002
26	29	0.015410	0.003003	0.000336	0.000001
25	30	0.010719	0.001809	0.000177	0.000000
24	31	0.007138	0.001047	0.000089	0.000000
23	32	0.004538	0.000567	0.000041	0.000000
22	33	0.002685	0.000294	0.000019	0.000000
21	34	0.001625	0.000155	0.000009	0.000000
20	35	0.001029	0.000091	0.000005	0.000000
19	36	0.000512	0.000038	0.000002	0.000000
18	37	0.000236	0.000015	0.000001	0.000000
17	38	0.000125	0.000007	0.000000	0.000000
16	39	0.000051	0.000003	0.000000	0.000000
15	40	0.000042	0.000002	0.000000	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 4

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
38	28	0.003030	0.006318	0.012349	0.022679	0.039239
37	29	0.003030	0.006009	0.011104	0.019154	0.030897
36	30	0.006061	0.011419	0.019968	0.032451	0.049091
35	31	0.009091	0.016210	0.026739	0.040856	0.057902
34	32	0.015152	0.025412	0.039364	0.056374	0.074723
33	33	0.018182	0.029035	0.042687	0.057832	0.072272
32	34	0.027273	0.041201	0.057200	0.073038	0.085853
31	35	0.033333	0.047421	0.061894	0.074164	0.081637
30	36	0.042424	0.057048	0.070265	0.079312	0.082089
29	37	0.048485	0.061612	0.071602	0.076132	0.074096
28	38	0.057576	0.069042	0.075658	0.075792	0.069437
27	39	0.060606	0.068694	0.071063	0.067116	0.057890
26	40	0.069697	0.074723	0.073109	0.065296	0.053257
25	41	0.069697	0.070418	0.064882	0.054524	0.041801
24	42	0.072727	0.069447	0.060470	0.048019	0.034783
23	43	0.069697	0.062904	0.051771	0.038857	0.026602
22	44	0.069697	0.059315	0.046053	0.032620	0.021079
21	45	0.060606	0.048792	0.035839	0.024017	0.014683
20	46	0.057576	0.043867	0.030530	0.019408	0.011269
19	47	0.048485	0.034881	0.022936	0.013781	0.007565
18	48	0.042424	0.028886	0.018001	0.010265	0.005354
17	49	0.033333	0.021486	0.012695	0.006873	0.003408
16	50	0.027273	0.016578	0.009247	0.004730	0.002218
15	51	0.018182	0.010474	0.005546	0.002697	0.001204
14	52	0.015152	0.008336	0.004229	0.001976	0.000850
13	53	0.009091	0.004711	0.002253	0.000994	0.000404
12	54	0.006061	0.002981	0.001357	0.000571	0.000222
11	55	0.003030	0.001422	0.000620	0.000251	0.000094
10	56	0.003030	0.001359	0.000569	0.000222	0.000081

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 4

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
38	28	0.064130	0.173920	0.352870	0.752125
37	29	0.046689	0.099750	0.147955	0.124165
36	30	0.069232	0.121635	0.143184	0.067422
35	31	0.076221	0.110813	0.105190	0.029786
34	32	0.091774	0.110853	0.085749	0.015156
33	33	0.083400	0.084867	0.054067	0.006102
32	34	0.092995	0.080008	0.042467	0.003173
31	35	0.082618	0.059290	0.025754	0.001203
30	36	0.077960	0.047271	0.017069	0.000510
29	37	0.066047	0.033881	0.010206	0.000202
28	38	0.058209	0.025506	0.006528	0.000093
27	39	0.045624	0.017012	0.003663	0.000035
26	40	0.039686	0.012869	0.002414	0.000018
25	41	0.029245	0.008047	0.001265	0.000006
24	42	0.022989	0.005484	0.000747	0.000003
23	43	0.016615	0.003438	0.000405	0.000001
22	44	0.012429	0.002226	0.000227	0.000000
21	45	0.008191	0.001276	0.000113	0.000000
20	46	0.005977	0.000826	0.000065	0.000000
19	47	0.003794	0.000455	0.000031	0.000000
18	48	0.002555	0.000272	0.000017	0.000000
17	49	0.001548	0.000146	0.000008	0.000000
16	50	0.000953	0.000078	0.000004	0.000000
15	51	0.000493	0.000036	0.000002	0.000000
14	52	0.000337	0.000023	0.000001	0.000000
13	53	0.000151	0.000009	0.000000	0.000000
12	54	0.000080	0.000004	0.000000	0.000000
11	55	0.000033	0.000002	0.000000	0.000000
10	56	0.000027	0.000001	0.000000	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 6 N = 5

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
45	21	0.002165	0.004711	0.009573	0.018210	0.032515
44	22	0.002165	0.004492	0.008652	0.015500	0.025877
43	23	0.004329	0.008561	0.015651	0.026493	0.041596
42	24	0.006494	0.012207	0.021141	0.033782	0.049876
41	25	0.010823	0.019288	0.031581	0.047567	0.065995
40	26	0.015152	0.025380	0.038991	0.054991	0.071272
39	27	0.021645	0.034390	0.049997	0.066565	0.081230
38	28	0.025974	0.039030	0.053521	0.067019	0.076687
37	29	0.034632	0.049238	0.063781	0.075322	0.081150
36	30	0.041126	0.055156	0.067296	0.074734	0.075584
35	31	0.049784	0.063023	0.072523	0.075886	0.072236
34	32	0.054113	0.064770	0.070351	0.069363	0.062105
33	33	0.062771	0.071001	0.072856	0.067841	0.057347
32	34	0.064935	0.069279	0.066986	0.058712	0.046659
31	35	0.069264	0.069758	0.063658	0.052645	0.039462
30	36	0.069264	0.065928	0.056855	0.044429	0.031468
29	37	0.069264	0.062313	0.050795	0.037522	0.025121
28	38	0.064935	0.055152	0.042444	0.029597	0.018703
27	39	0.062771	0.050333	0.036601	0.024136	0.014434
26	40	0.054113	0.041015	0.028198	0.017583	0.009943
25	41	0.049784	0.035737	0.023308	0.013811	0.007435
24	42	0.041126	0.027885	0.017188	0.009628	0.004900
23	43	0.034632	0.022182	0.012932	0.006860	0.003310
22	44	0.025974	0.015765	0.008722	0.004397	0.002019
21	45	0.021645	0.012458	0.006552	0.003148	0.001381
20	46	0.015152	0.008289	0.004152	0.001903	0.000797
19	47	0.010823	0.005573	0.002630	0.001137	0.000449
18	48	0.006494	0.003178	0.001429	0.000590	0.000223
17	49	0.004329	0.002021	0.000869	0.000344	0.000125
16	50	0.002165	0.000967	0.000399	0.000152	0.000054
15	51	0.002165	0.000926	0.000368	0.000136	0.000046

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 6   N = 5

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
45	21	0.054658	0.156928	0.331556	0.738712
44	22	0.040338	0.091940	0.143147	0.127564
43	23	0.060681	0.114453	0.142167	0.071525
42	24	0.068147	0.107122	0.107819	0.032658
41	25	0.084459	0.111017	0.091259	0.017112
40	26	0.084983	0.092363	0.061421	0.007004
39	27	0.090942	0.083325	0.045735	0.003286
38	28	0.080250	0.061163	0.027232	0.001163
37	29	0.079821	0.051724	0.019382	0.000574
36	30	0.069661	0.038021	0.011827	0.000229
35	31	0.062588	0.029110	0.007653	0.000104
34	32	0.050520	0.019894	0.004366	0.000039
33	33	0.044030	0.014991	0.002844	0.000019
32	34	0.033634	0.009714	0.001544	0.000007
31	35	0.026821	0.006672	0.000910	0.000003
30	36	0.020208	0.004364	0.000518	0.000001
29	37	0.015249	0.002858	0.000294	0.000001
28	38	0.010711	0.001732	0.000153	0.000000
27	39	0.007830	0.001109	0.000086	0.000000
26	40	0.005100	0.000628	0.000042	0.000000
25	41	0.003637	0.000401	0.000025	0.000000
24	42	0.002265	0.000216	0.000011	0.000000
23	43	0.001452	0.000122	0.000006	0.000000
22	44	0.000844	0.000063	0.000003	0.000000
21	45	0.000553	0.000038	0.000001	0.000000
20	46	0.000305	0.000019	0.000001	0.000000
19	47	0.000162	0.000009	0.000000	0.000000
18	48	0.000077	0.000004	0.000000	0.000000
17	49	0.000042	0.000002	0.000000	0.000000
16	50	0.000017	0.000001	0.000000	0.000000
15	51	0.000015	0.000001	0.000000	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
			M = 7	N = 5		
50	28	0.001263	0.002924	0.006292	0.012613	0.023629
49	29	0.001263	0.002797	0.005724	0.010848	0.019076
48	30	0.002525	0.005348	0.010423	0.018729	0.031083
47	31	0.003788	0.007654	0.014184	0.024148	0.037827
46	32	0.006313	0.012143	0.021361	0.034420	0.050875
45	33	0.008838	0.016064	0.026659	0.040439	0.056139
44	34	0.012626	0.021946	0.034729	0.050090	0.065917
43	35	0.016414	0.026969	0.040274	0.054704	0.067646
42	36	0.021465	0.033606	0.047710	0.061467	0.071922
41	37	0.026515	0.039333	0.052821	0.064258	0.070862
40	38	0.032828	0.046223	0.058845	0.067771	0.070650
39	39	0.037879	0.050521	0.060843	0.066188	0.065071
38	40	0.044192	0.056141	0.064325	0.066502	0.062069
37	41	0.049242	0.059174	0.064067	0.062518	0.055006
36	42	0.054293	0.061944	0.063635	0.058878	0.049083
35	43	0.058081	0.062792	0.061097	0.053516	0.042212
34	44	0.060606	0.062262	0.057537	0.047838	0.035795
33	45	0.061869	0.060174	0.052634	0.041410	0.029309
32	46	0.061869	0.057205	0.047569	0.035579	0.023941
31	47	0.060606	0.053061	0.041781	0.029591	0.018853
30	48	0.058081	0.048345	0.036212	0.024409	0.014809
29	49	0.054293	0.042840	0.030428	0.019455	0.011197
28	50	0.049242	0.036912	0.024919	0.015149	0.008293
27	51	0.044192	0.031363	0.020063	0.011566	0.006009
26	52	0.037879	0.025635	0.015656	0.008628	0.004290
25	53	0.032828	0.021072	0.012219	0.006400	0.003027
24	54	0.026515	0.016173	0.008922	0.004449	0.002005
23	55	0.021465	0.012424	0.006513	0.003090	0.001327
22	56	0.016414	0.009073	0.004552	0.002072	0.000855
21	57	0.012626	0.006607	0.003142	0.001357	0.000532
20	58	0.008838	0.004436	0.002029	0.000845	0.000320
19	59	0.006313	0.002998	0.001299	0.000513	0.000184
18	60	0.003788	0.001717	0.000712	0.000269	0.000093
17	61	0.002525	0.001096	0.000436	0.000159	0.000053
16	62	0.001263	0.000526	0.000201	0.000071	0.000023
15	63	0.001263	0.000505	0.000187	0.000064	0.000020

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 5

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
50	28	0.041490	0.130481	0.295070	0.712126
49	29	0.031195	0.078821	0.133180	0.132698
48	30	0.047737	0.100711	0.136950	0.078253
47	31	0.054617	0.096938	0.107804	0.037735
46	32	0.069084	0.103575	0.095027	0.021017
45	33	0.071414	0.089774	0.067623	0.009428
44	34	0.079244	0.085281	0.053839	0.004916
43	35	0.076227	0.068926	0.035814	0.002052
42	36	0.076500	0.059203	0.025868	0.000978
41	37	0.070893	0.046617	0.017039	0.000426
40	38	0.066716	0.037710	0.011729	0.000207
39	39	0.057849	0.027884	0.007295	0.000087
38	40	0.052332	0.022009	0.005003	0.000045
37	41	0.043659	0.015676	0.003004	0.000018
36	42	0.036883	0.011509	0.001907	0.000009
35	43	0.029995	0.008117	0.001162	0.000004
34	44	0.024115	0.005694	0.000707	0.000002
33	45	0.018669	0.003822	0.000410	0.000001
32	46	0.014498	0.002618	0.000248	0.000000
31	47	0.010808	0.001698	0.000139	0.000000
30	48	0.008088	0.001129	0.000083	0.000000
29	49	0.005802	0.000710	0.000046	0.000000
28	50	0.004089	0.000442	0.000025	0.000000
27	51	0.002813	0.000268	0.000013	0.000000
26	52	0.001925	0.000166	0.000008	0.000000
25	53	0.001293	0.000099	0.000004	0.000000
24	54	0.000816	0.000055	0.000002	0.000000
23	55	0.000515	0.000031	0.000001	0.000000
22	56	0.000320	0.000018	0.000001	0.000000
21	57	0.000189	0.000009	0.000000	0.000000
20	58	0.000110	0.000005	0.000000	0.000000
19	59	0.000060	0.000002	0.000000	0.000000
18	60	0.000029	0.000001	0.000000	0.000000
17	61	0.000016	0.000001	0.000000	0.000000
16	62	0.000007	0.000000	0.000000	0.000000
15	63	0.000006	0.000000	0.000000	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 6 N = 6

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
57	21	0.001082	0.002556	0.005598	0.011404	0.021673
56	22	0.001082	0.002447	0.005103	0.009837	0.017567
55	23	0.002165	0.004684	0.009311	0.017037	0.028745
54	24	0.003247	0.006713	0.012707	0.022057	0.035172
53	25	0.005411	0.010671	0.019210	0.031615	0.047640
52	26	0.007576	0.014181	0.024169	0.037557	0.053279
51	27	0.011905	0.021052	0.033861	0.049581	0.066162
50	28	0.014069	0.023749	0.036338	0.050446	0.063593
49	29	0.019481	0.031236	0.045321	0.059550	0.070919
48	30	0.023810	0.036247	0.049837	0.061928	0.069595
47	31	0.030303	0.043739	0.056945	0.066910	0.071002
46	32	0.034632	0.047407	0.058450	0.064937	0.065041
45	33	0.042208	0.054855	0.064155	0.067546	0.064055
44	34	0.045455	0.056068	0.062146	0.061917	0.055473
43	35	0.051948	0.060743	0.063778	0.060147	0.050968
42	36	0.055195	0.061234	0.060968	0.054491	0.043736
41	37	0.059524	0.062621	0.059104	0.050058	0.038055
40	38	0.059524	0.059438	0.053216	0.042727	0.030771
39	39	0.062771	0.059440	0.050474	0.038439	0.026261
38	40	0.059524	0.053442	0.043018	0.031046	0.020093
37	41	0.059524	0.050756	0.038824	0.026643	0.016407
36	42	0.055195	0.044641	0.032395	0.021092	0.012322
35	43	0.051948	0.039884	0.027487	0.017003	0.009441
34	44	0.045455	0.033104	0.021655	0.012722	0.006712
33	45	0.042208	0.029216	0.018189	0.010183	0.005127
32	46	0.034632	0.022780	0.013488	0.007188	0.003447
31	47	0.030303	0.018927	0.010653	0.005402	0.002466
30	48	0.023810	0.014117	0.007551	0.003642	0.001583
29	49	0.019481	0.010986	0.005600	0.002578	0.001072
28	50	0.014069	0.007550	0.003667	0.001612	0.000640
27	51	0.011905	0.006118	0.002855	0.001209	0.000464
26	52	0.007576	0.003681	0.001624	0.000650	0.000236
25	53	0.005411	0.002501	0.001053	0.000403	0.000140
24	54	0.003247	0.001436	0.000579	0.000213	0.000071
23	55	0.002165	0.000917	0.000356	0.000126	0.000041
22	56	0.001082	0.000441	0.000165	0.000057	0.000018
21	57	0.001082	0.000424	0.000153	0.000051	0.000016

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER
NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 6	N = 6		
57	21	0.038548	0.124428	0.286652	0.706096
56	22	0.029131	0.075775	0.130843	0.133921
55	23	0.044812	0.097559	0.135858	0.079958
54	24	0.051613	0.094781	0.108159	0.039043
53	25	0.065837	0.102400	0.096552	0.022001
52	26	0.069103	0.090358	0.069968	0.009972
51	27	0.080552	0.088946	0.057077	0.005194
50	28	0.072868	0.067931	0.035766	0.001954
49	29	0.076619	0.061113	0.027181	0.001026
48	30	0.070793	0.048060	0.017893	0.000446
47	31	0.068093	0.039618	0.012510	0.000219
46	32	0.058766	0.029188	0.007750	0.000090
45	33	0.054745	0.023573	0.005403	0.000047
44	34	0.044716	0.016495	0.003193	0.000019
43	35	0.038824	0.012383	0.002060	0.000009
42	36	0.031537	0.008749	0.001263	0.000004
41	37	0.025978	0.006268	0.000783	0.000002
40	38	0.019885	0.004168	0.000450	0.000001
39	39	0.016099	0.002959	0.000280	0.000000
38	40	0.011664	0.001866	0.000153	0.000000
37	41	0.009068	0.001288	0.000094	0.000000
36	42	0.006460	0.000802	0.000051	0.000000
35	43	0.004706	0.000516	0.000029	0.000000
34	44	0.003181	0.000308	0.000015	0.000000
33	45	0.002321	0.000202	0.000009	0.000000
32	46	0.001488	0.000115	0.000005	0.000000
31	47	0.001014	0.000069	0.000003	0.000000
30	48	0.000620	0.000038	0.000001	0.000000
29	49	0.000402	0.000022	0.000001	0.000000
28	50	0.000230	0.000011	0.000000	0.000000
27	51	0.000162	0.000008	0.000000	0.000000
26	52	0.000078	0.000003	0.000000	0.000000
25	53	0.000044	0.000002	0.000000	0.000000
24	54	0.000022	0.000001	0.000000	0.000000
23	55	0.000012	0.000000	0.000000	0.000000
22	56	0.000005	0.000000	0.000000	0.000000
21	57	0.000004	0.000000	0.000000	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 6

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
63	28	0.000583	0.001479	0.003460	0.007489	0.015041
62	29	0.000583	0.001420	0.003174	0.006525	0.012361
61	30	0.001166	0.002727	0.005830	0.011411	0.020495
60	31	0.001748	0.003922	0.008012	0.014933	0.025441
59	32	0.002914	0.006259	0.012209	0.021657	0.035002
58	33	0.004079	0.008360	0.015517	0.026119	0.039937
57	34	0.006410	0.012496	0.022026	0.035144	0.050829
56	35	0.008159	0.015162	0.025416	0.038468	0.052626
55	36	0.011072	0.019678	0.031471	0.045334	0.058880
54	37	0.013986	0.023685	0.036023	0.049245	0.060563
53	38	0.018065	0.029157	0.042195	0.054793	0.063898
52	39	0.021562	0.033121	0.045546	0.056103	0.061947
51	40	0.026807	0.039234	0.051355	0.060151	0.063081
50	41	0.030303	0.042269	0.052641	0.058560	0.058222
49	42	0.035548	0.047211	0.055928	0.059122	0.055797
48	43	0.039627	0.050124	0.056497	0.056767	0.050869
47	44	0.044289	0.053339	0.057203	0.054645	0.046517
46	45	0.047203	0.054111	0.055195	0.050111	0.040506
45	46	0.051282	0.055996	0.054386	0.046996	0.036142
44	47	0.052448	0.054530	0.050397	0.041413	0.030265
43	48	0.054779	0.054242	0.047745	0.037365	0.026006
42	49	0.054779	0.051641	0.043268	0.032224	0.021338
41	50	0.054779	0.049170	0.039229	0.027821	0.017541
40	51	0.052448	0.044837	0.034068	0.023009	0.013815
39	52	0.051282	0.041769	0.030255	0.019491	0.011170
38	53	0.047203	0.036634	0.025293	0.015535	0.008490
37	54	0.044289	0.032739	0.021543	0.012617	0.006578
36	55	0.039627	0.027909	0.017507	0.009780	0.004865
35	56	0.035548	0.023868	0.014287	0.007623	0.003626
34	57	0.030303	0.019389	0.011069	0.005637	0.002560
33	58	0.026807	0.016374	0.008938	0.004359	0.001899
32	59	0.021562	0.012559	0.006543	0.003047	0.001268
31	60	0.018065	0.010030	0.004987	0.002219	0.000884
30	61	0.013986	0.007412	0.003523	0.001501	0.000573
29	62	0.011072	0.005602	0.002546	0.001039	0.000380
28	63	0.008159	0.003956	0.001728	0.000679	0.000240
27	64	0.006410	0.002970	0.001241	0.000468	0.000159
26	65	0.004079	0.001800	0.000717	0.000258	0.000084
25	66	0.002914	0.001230	0.000470	0.000162	0.000051
24	67	0.001748	0.000708	0.000261	0.000087	0.000026
23	68	0.001166	0.000454	0.000161	0.000052	0.000015
22	69	0.000583	0.000219	0.000075	0.000024	0.000007
21	70	0.000583	0.000211	0.000070	0.000021	0.000006

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER
NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 6

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
63	28	0.028126	0.100769	0.250874	0.676902
62	29	0.021642	0.063224	0.119597	0.138391
61	30	0.033852	0.083503	0.128499	0.086826
60	31	0.039697	0.083353	0.106040	0.044643
59	32	0.051634	0.092699	0.098333	0.026580
58	33	0.055561	0.084873	0.074835	0.012981
57	34	0.066730	0.087148	0.064431	0.007329
56	35	0.065152	0.072388	0.044423	0.003169
55	36	0.069026	0.066126	0.034356	0.001645
54	37	0.067072	0.055120	0.024140	0.000772
53	38	0.066977	0.047569	0.017783	0.000401
52	39	0.061359	0.037468	0.011857	0.000181
51	40	0.059275	0.031563	0.008650	0.000098
50	41	0.051767	0.023791	0.005544	0.000043
49	42	0.047041	0.018828	0.003792	0.000021
48	43	0.040677	0.014197	0.002476	0.000010
47	44	0.035305	0.010770	0.001631	0.000005
46	45	0.029165	0.007764	0.001019	0.000002
45	46	0.024749	0.005801	0.000669	0.000001
44	47	0.019679	0.004038	0.000405	0.000001
43	48	0.016104	0.002926	0.000260	0.000000
42	49	0.012567	0.002010	0.000157	0.000000
41	50	0.009836	0.001390	0.000096	0.000000
40	51	0.007376	0.000922	0.000056	0.000000
39	52	0.005695	0.000636	0.000035	0.000000
38	53	0.004129	0.000410	0.000020	0.000000
37	54	0.003053	0.000270	0.000012	0.000000
36	55	0.002156	0.000170	0.000007	0.000000
35	56	0.001537	0.000109	0.000004	0.000000
34	57	0.001037	0.000066	0.000002	0.000000
33	58	0.000739	0.000043	0.000001	0.000000
32	59	0.000472	0.000024	0.000001	0.000000
31	60	0.000315	0.000015	0.000000	0.000000
30	61	0.000196	0.000008	0.000000	0.000000
29	62	0.000125	0.000005	0.000000	0.000000
28	63	0.000076	0.000003	0.000000	0.000000
27	64	0.000048	0.000002	0.000000	0.000000
26	65	0.000024	0.000001	0.000000	0.000000
25	66	0.000014	0.000000	0.000000	0.000000
24	67	0.000007	0.000000	0.000000	0.000000
23	68	0.000004	0.000000	0.000000	0.000000
22	69	0.000002	0.000000	0.000000	0.000000
21	70	0.000002	0.000000	0.000000	0.000000

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 7

WY	WX	D=0	D=.2	D=.4	D=.6	D=.8
77	28	0.000291	0.000802	0.002021	0.004681	0.010002
76	29	0.000291	0.000772	0.001865	0.004118	0.008332
75	30	0.000583	0.001487	0.003447	0.007271	0.013994
74	31	0.000874	0.002147	0.004770	0.009615	0.017615
73	32	0.001457	0.003439	0.007325	0.014105	0.024606
72	33	0.002040	0.004616	0.009401	0.017260	0.028619
71	34	0.003205	0.006945	0.013514	0.023647	0.037275
70	35	0.004371	0.009005	0.016637	0.027596	0.041148
69	36	0.005828	0.011558	0.020498	0.032541	0.046299
68	37	0.007576	0.014359	0.024287	0.036697	0.049584
67	38	0.009907	0.017981	0.029068	0.041894	0.053885
66	39	0.012238	0.021208	0.032680	0.044814	0.054735
65	40	0.015443	0.025617	0.037733	0.049388	0.057488
64	41	0.018357	0.029050	0.040766	0.050757	0.056108
63	42	0.021853	0.033096	0.044385	0.052739	0.055556
62	43	0.025350	0.036681	0.046943	0.053157	0.053295
61	44	0.029138	0.040309	0.049266	0.053221	0.050842
60	45	0.032634	0.043089	0.050216	0.051675	0.046975
59	46	0.036422	0.045993	0.051225	0.050336	0.043659
58	47	0.039627	0.047744	0.050698	0.047462	0.039186
57	48	0.042541	0.049038	0.049788	0.044538	0.035116
56	49	0.045163	0.049690	0.048133	0.041059	0.030855
55	50	0.047203	0.049637	0.045936	0.037421	0.026843
54	51	0.048368	0.048553	0.042881	0.033326	0.022797
53	52	0.049242	0.047274	0.039927	0.029674	0.019411
52	53	0.049242	0.045124	0.036377	0.025803	0.016108
51	54	0.048368	0.042390	0.032684	0.022173	0.013239
50	55	0.047203	0.039500	0.029085	0.018847	0.010749
49	56	0.045163	0.036134	0.025449	0.015778	0.008612
48	57	0.042541	0.032499	0.021862	0.012950	0.006755
47	58	0.039627	0.028983	0.018678	0.010607	0.005308
46	59	0.036422	0.025432	0.015655	0.008496	0.004064
45	60	0.032634	0.021809	0.012858	0.006687	0.003068
44	61	0.029138	0.018601	0.010485	0.005217	0.002291
43	62	0.025350	0.015488	0.008363	0.003990	0.001682
42	63	0.021853	0.012772	0.006605	0.003022	0.001223
41	64	0.018357	0.010280	0.005101	0.002241	0.000872
40	65	0.015443	0.008261	0.003919	0.001648	0.000614
39	66	0.012238	0.006275	0.002857	0.001154	0.000414
38	67	0.009907	0.004858	0.002118	0.000821	0.000283
37	68	0.007576	0.003564	0.001493	0.000557	0.000185
36	69	0.005828	0.002624	0.001055	0.000378	0.000121
35	70	0.004371	0.001900	0.000739	0.000257	0.000080
34	71	0.003205	0.001326	0.000491	0.000163	0.000048
33	72	0.002040	0.000810	0.000288	0.000092	0.000026
32	73	0.001457	0.000556	0.000191	0.000059	0.000016
31	74	0.000874	0.000322	0.000107	0.000032	0.000009
30	75	0.000583	0.000207	0.000066	0.000019	0.000005
29	76	0.000291	0.000100	0.000031	0.000009	0.000002
28	77	0.000291	0.000097	0.000029	0.000008	0.000002

TABLE C-1

DISTRIBUTION OF WILCOXON TWO-SAMPLE STATISTIC UNDER NORMAL SHIFT ALTERNATIVE D. SAMPLE SIZES M,N.

M = 7 N = 7

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
77	28	0.019782	0.079638	0.216173	0.645528
76	29	0.015492	0.051445	0.107544	0.142136
75	30	0.024631	0.069671	0.119508	0.093645
74	31	0.029396	0.071409	0.102129	0.050597
73	32	0.038965	0.081666	0.098225	0.031709
72	33	0.042935	0.077410	0.078200	0.016516
71	34	0.053020	0.082593	0.070621	0.009955
70	35	0.055232	0.073499	0.052523	0.004748
69	36	0.059117	0.068455	0.041645	0.002514
68	37	0.059980	0.059986	0.030950	0.001260
67	38	0.061917	0.053935	0.023894	0.000689
66	39	0.059599	0.044928	0.016948	0.000334
65	40	0.059564	0.039386	0.012908	0.000188
64	41	0.055108	0.031598	0.008846	0.000088
63	42	0.051920	0.026112	0.006348	0.000047
62	43	0.047339	0.020837	0.004393	0.000024
61	44	0.042979	0.016622	0.003052	0.000012
60	45	0.037745	0.012789	0.002040	0.000006
59	46	0.033444	0.010021	0.001407	0.000003
58	47	0.028548	0.007511	0.000919	0.000002
57	48	0.024416	0.005703	0.000618	0.000001
56	49	0.020435	0.004214	0.000401	0.000000
55	50	0.016961	0.003103	0.000261	0.000000
54	51	0.013732	0.002224	0.000165	0.000000
53	52	0.011181	0.001620	0.000108	0.000000
52	53	0.008853	0.001140	0.000067	0.000000
51	54	0.006958	0.000801	0.000042	0.000000
50	55	0.005398	0.000554	0.000026	0.000000
49	56	0.004140	0.000382	0.000016	0.000000
48	57	0.003104	0.000256	0.000010	0.000000
47	58	0.002342	0.000175	0.000006	0.000000
46	59	0.001714	0.000114	0.000004	0.000000
45	60	0.001242	0.000075	0.000002	0.000000
44	61	0.000888	0.000048	0.000001	0.000000
43	62	0.000626	0.000031	0.000001	0.000000
42	63	0.000438	0.000020	0.000000	0.000000
41	64	0.000300	0.000012	0.000000	0.000000
40	65	0.000203	0.000007	0.000000	0.000000
39	66	0.000132	0.000004	0.000000	0.000000
38	67	0.000086	0.000003	0.000000	0.000000
37	68	0.000055	0.000002	0.000000	0.000000
36	69	0.000034	0.000001	0.000000	0.000000
35	70	0.000022	0.000001	0.000000	0.000000
34	71	0.000013	0.000000	0.000000	0.000000
33	72	0.000007	0.000000	0.000000	0.000000
32	73	0.000004	0.000000	0.000000	0.000000
31	74	0.000002	0.000000	0.000000	0.000000
30	75	0.000001	0.000000	0.000000	0.000000
29	76	0.000001	0.000000	0.000000	0.000000
28	77	0.000000	0.000000	0.000000	0.000000

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 1 N = 1		
2	1	0.046286	0.087321	0.123403	0.154848
1	2	-0.051814	-0.109413	-0.173036	-0.242902
			M = 2 N = 1		
3	3	0.069734	0.132139	0.187566	0.236388
2	4	-0.004788	-0.019152	-0.043083	-0.076569
1	5	-0.077384	-0.162717	-0.256271	-0.358297
			M = 3 N = 1		
4	6	0.085049	0.161602	0.230018	0.290686
3	7	0.020251	0.029444	0.027634	0.014881
2	8	-0.031361	-0.073879	-0.127598	-0.192557
1	9	-0.093877	-0.196885	-0.309303	-0.431384
			M = 2 N = 2		
7	3	0.109578	0.208200	0.296346	0.374531
6	4	0.056418	0.098575	0.126670	0.140911
5	5	-0.007010	-0.028032	-0.063038	-0.111979
4	6	-0.070867	-0.156362	-0.256651	-0.371892
3	7	-0.120983	-0.253785	-0.398793	-0.556361
			M = 4 N = 1		
5	10	0.096269	0.183272	0.261368	0.330947
4	11	0.037028	0.062163	0.075476	0.077042
3	12	-0.006194	-0.024777	-0.055744	-0.099092
2	13	-0.048988	-0.109998	-0.183090	-0.268320
1	14	-0.105864	-0.221624	-0.347555	-0.483910
			M = 3 N = 2		
9	6	0.137212	0.261174	0.372433	0.471573
8	7	0.092634	0.168675	0.228381	0.272024
7	8	0.041845	0.066456	0.073981	0.064585
6	9	-0.008831	-0.035310	-0.079401	-0.141041
5	10	-0.059209	-0.135893	-0.230145	-0.342043
4	11	-0.109472	-0.236013	-0.379839	-0.541152
3	12	-0.150973	-0.316180	-0.496062	-0.691026

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 1	N = 1		
2	1	0.181986	0.233290	0.265455	0.293607
1	2	-0.319211	-0.539336	-0.803273	-1.469867
		M = 2	N = 1		
3	3	0.279006	0.361243	0.414522	0.463353
2	4	-0.119594	-0.268738	-0.476905	-1.067818
1	5	-0.469024	-0.785238	-1.159899	-2.093078
		M = 3	N = 1		
4	6	0.344024	0.448312	0.517351	0.582688
3	7	-0.008753	-0.114983	-0.287611	-0.826659
2	8	-0.268792	-0.508920	-0.820138	-1.656946
1	9	-0.563361	-0.937949	-1.378516	-2.466330
		M = 2	N = 2		
7	3	0.443306	0.577967	0.667406	0.752601
6	4	0.141517	0.084889	-0.051759	-0.549259
5	5	-0.174791	-0.391921	-0.693430	-1.540042
4	6	-0.502233	-0.895034	-1.384968	-2.662421
3	7	-0.726818	-1.211290	-1.782295	-3.196953
		M = 4	N = 1		
5	10	0.392432	0.513793	0.595407	0.674545
4	11	0.066941	-0.008792	-0.155473	-0.655095
3	12	-0.154814	-0.348199	-0.618691	-1.389958
2	13	-0.365739	-0.662928	-1.037276	-2.019610
1	14	-0.630918	-1.046376	-1.532496	-2.725380
		M = 3	N = 2		
9	6	0.559221	0.732504	0.849522	0.964030
8	7	0.299890	0.302532	0.213477	-0.218242
7	8	0.038452	-0.098725	-0.335543	-1.090671
6	9	-0.220140	-0.493431	-0.872370	-1.929962
5	10	-0.471646	-0.873344	-1.386116	-2.742561
4	11	-0.720146	-1.246118	-1.886157	-3.517126
3	12	-0.901453	-1.497395	-2.196884	-3.920819

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 5	N = 1	
6	15	0.105048	0.200276	0.286039	0.362724
5	16	0.049496	0.086551	0.111242	0.123648
4	17	0.010962	0.008846	-0.006327	-0.034538
3	18	-0.024056	-0.061223	-0.111515	-0.174946
2	19	-0.062011	-0.136606	-0.223850	-0.323804
1	20	-0.115192	-0.240824	-0.377167	-0.524468
			M = 4	N = 2	
11	10	0.158190	0.301510	0.430544	0.545915
10	11	0.118421	0.218722	0.301193	0.366143
9	12	0.073359	0.127743	0.163341	0.180362
8	13	0.036196	0.052322	0.048543	0.025040
7	14	-0.009917	-0.039654	-0.089171	-0.158398
6	15	-0.056411	-0.133165	-0.230375	-0.348139
5	16	-0.092506	-0.204311	-0.335554	-0.486355
4	17	-0.136816	-0.292287	-0.466657	-0.660154
3	18	-0.173605	-0.363130	-0.569042	-0.791782
			M = 3	N = 3	
15	6	0.174868	0.333258	0.475835	0.603305
14	7	0.138310	0.256861	0.356014	0.436144
13	8	0.099331	0.177376	0.234430	0.270806
12	9	0.050320	0.079144	0.086604	0.072865
11	10	0.012549	0.002351	-0.030517	-0.085960
10	11	-0.035356	-0.093560	-0.174637	-0.278593
9	12	-0.071921	-0.165520	-0.280845	-0.417919
8	13	-0.120894	-0.263612	-0.428396	-0.615475
7	14	-0.158409	-0.337240	-0.536797	-0.757369
6	15	-0.191966	-0.401610	-0.629472	-0.876057
			M = 6	N = 1	
7	21	0.112219	0.214195	0.306279	0.388850
6	22	0.059341	0.105846	0.139594	0.160669
5	23	0.023863	0.034195	0.031024	0.014376
4	24	-0.006858	-0.027431	-0.061719	-0.109719
3	25	-0.037417	-0.088412	-0.153008	-0.231225
2	26	-0.072253	-0.157488	-0.255773	-0.367173
1	27	-0.122780	-0.256412	-0.401160	-0.557268

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 5	N = 1		
6	15	0.430750	0.566005	0.658079	0.749104
5	16	0.123858	0.071624	-0.054717	-0.522592
4	17	-0.075765	-0.235617	-0.476262	-1.198004
3	18	-0.251528	-0.500584	-0.832029	-1.742389
2	19	-0.436525	-0.774543	-1.193469	-2.276627
1	20	-0.682951	-1.129391	-1.649721	-2.920602
		M = 4	N = 2		
11	10	0.648292	0.852146	0.991514	1.130716
10	11	0.413894	0.460289	0.407041	0.026354
9	12	0.179036	0.097126	-0.093435	-0.779483
8	13	-0.017977	-0.209308	-0.516669	-1.455575
7	14	-0.247240	-0.554224	-0.979904	-2.166981
6	15	-0.486544	-0.923323	-1.490431	-3.017390
5	16	-0.656816	-1.169544	-1.806708	-3.455622
4	17	-0.872994	-1.491006	-2.233959	-4.107906
3	18	-1.031749	-1.709432	-2.502104	-4.443698
		M = 3	N = 3		
15	6	0.716419	0.941720	1.095916	1.250367
14	7	0.497649	0.572675	0.540804	0.186023
13	8	0.286840	0.240291	0.074921	-0.584691
12	9	0.038121	-0.139078	-0.441590	-1.397325
11	10	-0.163865	-0.455982	-0.885016	-2.139622
10	11	-0.405419	-0.822315	-1.381032	-2.917215
9	12	-0.576737	-1.068644	-1.695022	-3.342307
8	13	-0.825057	-1.448757	-2.217098	-4.193820
7	14	-0.999228	-1.698623	-2.536107	-4.619789
6	15	-1.141836	-1.893062	-2.773142	-4.920819
		M = 6	N = 1		
7	21	0.462325	0.609269	0.710295	0.811779
6	22	0.169159	0.135950	0.026277	-0.415066
5	23	-0.015718	-0.149585	-0.366789	-1.048857
4	24	-0.171428	-0.385650	-0.685448	-1.541282
3	25	-0.323085	-0.612531	-0.987611	-1.995515
2	26	-0.491747	-0.861184	-1.314119	-2.473208
1	27	-0.724954	-1.196109	-1.743552	-3.075721

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 5 N = 2		
13	15	0.174997	0.333900	0.477315	0.605890
12	16	0.138369	0.257505	0.357720	0.439343
11	17	0.096779	0.173380	0.230022	0.266940
10	18	0.065568	0.109795	0.132873	0.135021
9	19	0.028290	0.034943	0.020100	-0.016073
8	20	-0.010869	-0.043460	-0.097724	-0.173578
7	21	-0.050045	-0.121946	-0.215781	-0.331616
6	22	-0.087084	-0.195841	-0.326409	-0.478913
5	23	-0.117154	-0.254864	-0.413295	-0.592595
4	24	-0.157895	-0.335595	-0.533359	-0.751433
3	25	-0.191652	-0.400481	-0.626975	-0.871580
			M = 4 N = 3		
18	10	0.204202	0.389541	0.556755	0.706632
17	11	0.172096	0.322190	0.450714	0.558116
16	12	0.138381	0.253072	0.344429	0.412831
15	13	0.098177	0.171975	0.221631	0.247414
14	14	0.062504	0.099761	0.111919	0.099160
13	15	0.023821	0.021285	-0.007534	-0.062542
12	16	-0.012934	-0.051722	-0.116321	-0.206657
11	17	-0.050238	-0.126934	-0.230113	-0.359781
10	18	-0.087872	-0.201201	-0.340046	-0.504439
9	19	-0.122768	-0.270309	-0.442783	-0.640323
8	20	-0.162410	-0.349162	-0.560557	-0.796867
7	21	-0.194504	-0.411807	-0.652270	-0.916253
6	22	-0.223759	-0.467725	-0.732509	-1.018673
			M = 7 N = 1		
8	28	0.118256	0.225934	0.323376	0.410959
7	29	0.067429	0.121722	0.162958	0.191221
6	30	0.034132	0.054407	0.060858	0.053513
5	31	0.006189	-0.001735	-0.023762	-0.059883
4	32	-0.020309	-0.054744	-0.103314	-0.166024
3	33	-0.048016	-0.109942	-0.185806	-0.275631
2	34	-0.080642	-0.174568	-0.281847	-0.402544
1	35	-0.129148	-0.269472	-0.421233	-0.584667

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 5	N = 2		
13	15	0.720318	0.949451	1.107631	1.268235
12	16	0.502720	0.583769	0.559235	0.220313
11	17	0.284389	0.244702	0.090013	-0.541087
10	18	0.116478	-0.018572	-0.276166	-1.132350
9	19	-0.073382	-0.307570	-0.667824	-1.739411
8	20	-0.270903	-0.606968	-1.072145	-2.360484
7	21	-0.469500	-0.910857	-1.490363	-3.062181
6	22	-0.653465	-1.186931	-1.860050	-3.628563
5	23	-0.792900	-1.386334	-2.113351	-3.974489
4	24	-0.990046	-1.677867	-2.498516	-4.563837
3	25	-1.134719	-1.876102	-2.740764	-4.832682
		M = 4	N = 3		
18	10	0.840006	1.107151	1.291829	1.480130
17	11	0.644868	0.774666	0.786667	0.492373
16	12	0.458680	0.477472	0.365275	-0.219089
15	13	0.249622	0.154246	-0.080207	-0.934245
14	14	0.061693	-0.138369	-0.486377	-1.597982
13	15	-0.143629	-0.459564	-0.935186	-2.352385
12	16	-0.322629	-0.723763	-1.281273	-2.847620
11	17	-0.515926	-1.021882	-1.692074	-3.516413
10	18	-0.694374	-1.280645	-2.024729	-3.971632
9	19	-0.863034	-1.530431	-2.356251	-4.485895
8	20	-1.058366	-1.823830	-2.751782	-5.154902
7	21	-1.204074	-2.029909	-3.011887	-5.455932
6	22	-1.326725	-2.195860	-3.212894	-5.455932
		M = 7	N = 1		
8	28	0.489093	0.646113	0.754959	0.865789
7	29	0.206602	0.189320	0.093732	-0.324852
6	30	0.032406	-0.080346	-0.278327	-0.927394
5	31	-0.110088	-0.297146	-0.571977	-1.384067
4	32	-0.242879	-0.496931	-0.839476	-1.790163
3	33	-0.379442	-0.700299	-1.109029	-2.191168
2	34	-0.536718	-0.931491	-1.411679	-2.631081
1	35	-0.759990	-1.251564	-1.821276	-3.203148

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 6 N = 2		
15	21	0.188952	0.360848	0.516303	0.655979
14	22	0.154571	0.289048	0.403758	0.499042
13	23	0.115381	0.209678	0.283128	0.335984
12	24	0.087656	0.153079	0.196479	0.218092
11	25	0.054527	0.086424	0.095860	0.083030
10	26	0.025158	0.027128	0.006073	-0.037811
9	27	-0.011519	-0.046062	-0.103581	-0.184001
8	28	-0.048488	-0.120424	-0.215908	-0.335024
7	29	-0.077302	-0.177503	-0.300709	-0.447008
6	30	-0.110080	-0.242756	-0.398181	-0.576499
5	31	-0.136680	-0.294860	-0.474724	-0.676440
4	32	-0.174971	-0.370630	-0.587250	-0.825089
3	33	-0.206583	-0.431328	-0.674734	-0.937250
			M = 5 N = 3		
21	15	0.228131	0.435537	0.623010	0.791392
20	16	0.198909	0.374097	0.526045	0.655257
19	17	0.168347	0.311246	0.429098	0.522328
18	18	0.132292	0.238399	0.318607	0.373232
17	19	0.104368	0.181233	0.230853	0.253518
16	20	0.067658	0.107280	0.119020	0.103067
15	21	0.035946	0.043301	0.022170	-0.027319
14	22	0.000041	-0.028925	-0.086877	-0.173769
13	23	-0.029044	-0.087059	-0.173989	-0.289747
12	24	-0.064616	-0.157955	-0.280043	-0.430883
11	25	-0.095817	-0.219883	-0.372258	-0.552970
10	26	-0.132107	-0.292164	-0.480361	-0.696866
9	27	-0.158736	-0.344148	-0.556441	-0.795800
8	28	-0.194173	-0.414527	-0.661399	-0.935108
7	29	-0.223085	-0.470788	-0.743510	-1.041653
6	30	-0.249597	-0.521360	-0.815935	-1.133943

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
			M = 6	N = 2	
15	21	0.780585	1.031251	1.205678	1.385207
14	22	0.575264	0.684965	0.684390	0.380842
13	23	0.368522	0.362962	0.237535	-0.348049
12	24	0.218175	0.126152	-0.093192	-0.885590
11	25	0.048157	-0.133678	-0.446440	-1.434809
10	26	-0.104296	-0.367501	-0.764516	-1.924385
9	27	-0.287206	-0.643790	-1.137906	-2.508989
8	28	-0.477842	-0.938937	-1.549123	-3.217719
7	29	-0.616476	-1.141863	-1.812980	-3.592213
6	30	-0.777833	-1.382580	-2.133382	-4.075721
5	31	-0.900166	-1.556659	-2.353498	-4.376751
4	32	-1.084391	-1.827993	-2.710233	-4.950782
3	33	-1.219314	-2.012388	-2.935842	-5.251812
			M = 5	N = 3	
21	15	0.941575	1.243742	1.454305	1.672085
20	16	0.762257	0.936226	0.983935	0.739668
19	17	0.591385	0.661437	0.591515	0.068518
18	18	0.402624	0.368301	0.185749	-0.587894
17	19	0.249546	0.125483	-0.156131	-1.155180
16	20	0.059643	-0.167261	-0.558634	-1.799167
15	21	-0.105009	-0.421340	-0.909061	-2.378298
14	22	-0.289531	-0.704554	-1.297152	-3.000986
13	23	-0.434216	-0.919936	-1.580717	-3.405681
12	24	-0.610449	-1.184611	-1.936227	-3.958081
11	25	-0.762014	-1.408193	-2.229301	-4.382580
10	26	-0.941826	-1.679551	-2.597636	-4.950782
9	27	-1.062378	-1.848748	-2.807767	-5.251812
8	28	-1.235950	-2.108485	-3.156643	-5.552842
7	29	-1.365602	-2.290390	-3.382579	-5.552842
6	30	-1.475909	-2.438898	-3.561615	-5.552842

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 4	N = 4	
26	10	0.240762	0.459603	0.657377	0.834986
25	11	0.212881	0.400875	0.564517	0.704365
24	12	0.184181	0.341656	0.472875	0.578308
23	13	0.152301	0.276582	0.373226	0.442640
22	14	0.115221	0.202077	0.260786	0.291602
21	15	0.084805	0.139592	0.164514	0.159745
20	16	0.052335	0.074346	0.066194	0.028066
19	17	0.016823	0.002889	-0.041747	-0.117007
18	18	-0.015355	-0.061405	-0.138099	-0.245351
17	19	-0.047610	-0.126010	-0.235176	-0.375060
16	20	-0.082792	-0.196152	-0.340166	-0.514898
15	21	-0.114953	-0.260159	-0.435700	-0.641634
14	22	-0.143773	-0.316247	-0.517540	-0.747742
13	23	-0.180679	-0.390076	-0.628502	-0.896256
12	24	-0.211308	-0.450146	-0.716889	-1.011887
11	25	-0.238279	-0.502452	-0.792966	-1.110283
10	26	-0.263481	-0.550438	-0.861561	-1.197534
			M = 7	N = 2	
17	28	0.200846	0.383850	0.549634	0.698869
16	29	0.168168	0.315549	0.442479	0.549311
15	30	0.130766	0.239732	0.327144	0.393271
14	31	0.105376	0.187833	0.247592	0.284899
13	32	0.074817	0.126283	0.154581	0.159926
12	33	0.050006	0.076056	0.078345	0.057094
11	34	0.020114	0.016048	-0.012052	-0.064009
10	35	-0.012104	-0.048399	-0.108832	-0.193317
9	36	-0.044415	-0.113232	-0.206528	-0.324369
8	37	-0.074126	-0.172515	-0.295290	-0.442558
7	38	-0.098330	-0.220315	-0.366076	-0.535720
6	39	-0.128498	-0.280299	-0.455569	-0.654463
5	40	-0.152798	-0.327839	-0.525321	-0.745428
4	41	-0.189268	-0.399935	-0.632284	-0.886564
3	42	-0.219268	-0.457500	-0.715182	-0.992787

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
			M = 4	N = 4	
26	10	0.993387	1.312088	1.534257	1.764372
25	11	0.821003	1.015063	1.077854	0.852154
24	12	0.658455	0.751689	0.699104	0.196538
23	13	0.485260	0.477711	0.313847	-0.442799
22	14	0.294814	0.184328	-0.090261	-1.096902
21	15	0.125482	-0.087716	-0.479797	-1.780447
20	16	-0.039823	-0.338069	-0.815979	-2.284749
19	17	-0.222782	-0.619798	-1.203828	-2.915781
18	18	-0.383039	-0.859272	-1.520941	-3.375847
17	19	-0.545584	-1.105164	-1.852973	-3.896196
16	20	-0.720388	-1.368769	-2.209152	-4.455932
15	21	-0.877990	-1.601942	-2.515216	-4.899630
14	22	-1.006904	-1.781549	-2.736601	-5.154902
13	23	-1.193623	-2.068305	-3.133712	-5.632023
12	24	-1.335489	-2.271808	-3.391474	-5.632023
11	25	-1.454804	-2.438064	-3.598599	-5.632023
10	26	-1.558965	-2.577410	-3.774690	-5.632023
			M = 7	N = 2	
17	28	0.832272	1.101676	1.290406	1.486921
16	29	0.636417	0.770510	0.790478	0.517622
15	30	0.438400	0.461443	0.360703	-0.186070
14	31	0.300027	0.242850	0.054586	-0.685854
13	32	0.142558	0.001684	-0.273844	-1.197273
12	33	0.012565	-0.198501	-0.546850	-1.617795
11	34	-0.139609	-0.430250	-0.861376	-2.107438
10	35	-0.301724	-0.676100	-1.194242	-2.625142
9	36	-0.466802	-0.930683	-1.548703	-3.246417
8	37	-0.614411	-1.152077	-1.844798	-3.698102
7	38	-0.729337	-1.318748	-2.059344	-3.996539
6	39	-0.877113	-1.538469	-2.350802	-4.443698
5	40	-0.988328	-1.696286	-2.549936	-4.703335
4	41	-1.163051	-1.952757	-2.886191	-5.142668
3	42	-1.290737	-2.127099	-3.099306	-5.443698

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 6 N = 3		
24	21	0.248266	0.474306	0.678944	0.863063
23	22	0.221092	0.417084	0.588497	0.735871
22	23	0.192687	0.358547	0.498014	0.611546
21	24	0.159212	0.290859	0.395264	0.472784
20	25	0.135094	0.241262	0.318806	0.368055
19	26	0.104768	0.179794	0.225336	0.241689
18	27	0.073894	0.117826	0.131957	0.116486
17	28	0.043393	0.055774	0.037241	-0.012085
16	29	0.013755	-0.003406	-0.051415	-0.130174
15	30	-0.015641	-0.062550	-0.140689	-0.249990
14	31	-0.044704	-0.120360	-0.226936	-0.364366
13	32	-0.074480	-0.180100	-0.316893	-0.484866
12	33	-0.103982	-0.238143	-0.402538	-0.597187
11	34	-0.134743	-0.299669	-0.494962	-0.720787
10	35	-0.164291	-0.358027	-0.581434	-0.834710
9	36	-0.187077	-0.402288	-0.645877	-0.918073
8	37	-0.219923	-0.467467	-0.742999	-1.046865
7	38	-0.246689	-0.519444	-0.818716	-1.144926
6	39	-0.271276	-0.566278	-0.885699	-1.230190
			M = 5 N = 4		
30	15	0.271014	0.517665	0.740889	0.941677
29	16	0.245860	0.464543	0.656670	0.822884
28	17	0.220138	0.411273	0.573924	0.708635
27	18	0.192136	0.353871	0.485654	0.587965
26	19	0.160767	0.290436	0.389336	0.457829
25	20	0.130857	0.229526	0.296229	0.331221
24	21	0.103528	0.173889	0.211295	0.215986
23	22	0.072025	0.110159	0.114545	0.085351
22	23	0.041932	0.049910	0.024036	-0.035547
21	24	0.013529	-0.007466	-0.062891	-0.152624
20	25	-0.017273	-0.069077	-0.155366	-0.276063
19	26	-0.048115	-0.130852	-0.248218	-0.400194
18	27	-0.075953	-0.185959	-0.330013	-0.508074
17	28	-0.106036	-0.246178	-0.420501	-0.629057
16	29	-0.136878	-0.307263	-0.511284	-0.749046
15	30	-0.163230	-0.358987	-0.587392	-0.848528
14	31	-0.192161	-0.415988	-0.671711	-0.959541
13	32	-0.222963	-0.477154	-0.762951	-1.080722
12	33	-0.249633	-0.529227	-0.839233	-1.180049
11	34	-0.273628	-0.575594	-0.906413	-1.266666
10	35	-0.296257	-0.618573	-0.967714	-1.344414

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 6	N = 3		
24	21	1.027597	1.359873	1.592956	1.836911
23	22	0.859774	1.070775	1.148630	0.947107
22	23	0.699629	0.811908	0.777097	0.305833
21	24	0.523805	0.538286	0.397539	-0.310495
20	25	0.389373	0.323213	0.092625	-0.820351
19	26	0.229182	0.074227	-0.251249	-1.367980
18	27	0.071651	-0.166918	-0.581200	-1.898349
17	28	-0.092065	-0.424965	-0.945056	-2.528298
16	29	-0.239551	-0.645759	-1.238527	-2.960526
15	30	-0.390361	-0.876315	-1.552723	-3.457673
14	31	-0.532549	-1.086488	-1.828085	-3.848477
13	32	-0.684002	-1.317837	-2.144553	-4.364516
12	33	-0.822075	-1.516122	-2.396552	-4.690370
11	34	-0.977291	-1.753584	-2.723924	-5.297569
10	35	-1.118041	-1.958864	-2.990251	-5.677780
9	36	-1.219073	-2.098760	-3.161907	-5.552842
8	37	-1.379408	-2.338130	-3.484656	-5.552842
7	38	-1.498460	-2.504013	-3.695511	-5.552842
6	39	-1.600342	-2.641153	-3.845273	-5.552842
		M = 5	N = 4		
30	15	1.121073	1.483335	1.737571	2.004250
29	16	0.963854	1.210436	1.315019	1.146500
28	17	0.815980	0.968613	0.964145	0.529222
27	18	0.661312	0.721578	0.613642	-0.061639
26	19	0.496312	0.464177	0.255252	-0.650832
25	20	0.334792	0.208501	-0.105727	-1.261456
24	21	0.188231	-0.021074	-0.425647	-1.791234
23	22	0.022768	-0.278262	-0.782347	-2.376751
22	23	-0.128664	-0.506615	-1.087981	-2.831444
21	24	-0.276513	-0.734353	-1.400468	-3.333567
20	25	-0.431059	-0.967570	-1.714087	-3.814458
19	26	-0.586729	-1.203686	-2.034041	-4.317773
18	27	-0.720062	-1.397575	-2.283297	-4.662269
17	28	-0.871872	-1.628796	-2.599324	-5.154902
16	29	-1.020620	-1.847754	-2.886266	-5.501690
15	30	-1.142448	-2.020629	-3.102593	-5.677780
14	31	-1.279660	-2.222022	-3.368150	-5.677780
13	32	-1.430790	-2.449380	-3.677780	-5.677780
12	33	-1.552104	-2.620875	-3.899629	-5.677780
11	34	-1.656839	-2.766090	-4.054531	-5.677780
10	35	-1.749487	-2.891029	-4.200659	-5.677780

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 7 N = 3

WY	WX	D=.2	D=.4	D=.6	D=.8
27	28	0.265608	0.507734	0.727239	0.925029
26	29	0.239976	0.453706	0.641746	0.804666
25	30	0.213158	0.398362	0.556073	0.686773
24	31	0.181502	0.334315	0.458799	0.555338
23	32	0.159769	0.289510	0.389551	0.460253
22	33	0.132658	0.234474	0.305746	0.346809
21	34	0.106432	0.181538	0.225565	0.238794
20	35	0.077913	0.123867	0.138036	0.120630
19	36	0.051746	0.070930	0.057682	0.012155
18	37	0.021981	0.011233	-0.032192	-0.108215
17	38	-0.002048	-0.037017	-0.104822	-0.205348
16	39	-0.030922	-0.094835	-0.191728	-0.321559
15	40	-0.054728	-0.142192	-0.262345	-0.415107
14	41	-0.084409	-0.201558	-0.351500	-0.534256
13	42	-0.110006	-0.252206	-0.426668	-0.633420
12	43	-0.137970	-0.307663	-0.509232	-0.742812
11	44	-0.163771	-0.358895	-0.585586	-0.844048
10	45	-0.190097	-0.410796	-0.662349	-0.944973
9	46	-0.210518	-0.450354	-0.719786	-1.019070
8	47	-0.241546	-0.511885	-0.811410	-1.140502
7	48	-0.266737	-0.560735	-0.882475	-1.232397
6	49	-0.289881	-0.604805	-0.945431	-1.312505

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
		M = 7	N = 3		
27	28	1.102071	1.460749	1.713774	1.981302
26	29	0.943067	1.185947	1.289902	1.125738
25	30	0.790976	0.939165	0.934390	0.507838
24	31	0.624352	0.679535	0.573794	-0.078963
23	32	0.502013	0.482752	0.293559	-0.550028
22	33	0.358041	0.258522	-0.016307	-1.041127
21	34	0.221553	0.047735	-0.306441	-1.507136
20	35	0.071902	-0.184820	-0.628743	-2.031868
19	36	-0.065468	-0.398462	-0.926375	-2.542623
18	37	-0.216721	-0.629070	-1.240193	-3.037725
17	38	-0.338444	-0.812308	-1.484147	-3.393189
16	39	-0.484254	-1.033956	-1.785400	-3.871601
15	40	-0.600359	-1.204448	-2.006475	-4.172631
14	41	-0.749831	-1.432064	-2.317674	-4.670941
13	42	-0.872460	-1.610896	-2.548598	-4.978811
12	43	-1.008513	-1.813754	-2.820941	-5.464887
11	44	-1.134451	-2.001218	-3.070786	-5.619789
10	45	-1.258887	-2.181840	-3.302770	-5.619789
9	46	-1.348451	-2.304869	-3.453457	-5.619789
8	47	-1.499463	-2.529885	-3.759452	-5.619789
7	48	-1.610974	-2.685289	-3.966575	-5.619789
6	49	-1.706503	-2.813607	-4.075719	-5.619789

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 6 N = 4

WY	WX	D=.2	D=.4	D=.6	D=.8
34	21	0.296750	0.567130	0.812132	1.032813
33	22	0.273523	0.517992	0.734090	0.922528
32	23	0.249829	0.468794	0.657476	0.816476
31	24	0.224215	0.416165	0.576356	0.705323
30	25	0.195741	0.358496	0.488649	0.586622
29	26	0.171506	0.308636	0.411730	0.481162
28	27	0.143685	0.252439	0.326525	0.366245
27	28	0.116952	0.197852	0.242899	0.252320
26	29	0.089204	0.142031	0.158651	0.139264
25	30	0.062437	0.087981	0.076748	0.028887
24	31	0.035974	0.034648	-0.003858	-0.079388
23	32	0.008260	-0.021080	-0.087948	-0.192236
22	33	-0.018676	-0.074683	-0.167960	-0.298408
21	34	-0.045907	-0.129477	-0.250701	-0.409538
20	35	-0.073365	-0.184178	-0.332468	-0.518234
19	36	-0.099412	-0.235845	-0.409308	-0.619775
18	37	-0.125717	-0.288049	-0.487074	-0.722830
17	38	-0.153179	-0.342736	-0.568793	-0.831449
16	39	-0.178842	-0.393036	-0.642738	-0.928078
15	40	-0.206190	-0.447353	-0.723739	-1.035580
14	41	-0.229080	-0.491819	-0.788512	-1.119408
13	42	-0.256956	-0.547103	-0.870877	-1.228662
12	43	-0.281232	-0.594403	-0.939992	-1.318419
11	44	-0.303234	-0.636783	-1.001270	-1.397202
10	45	-0.324056	-0.676306	-1.057540	-1.468534

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 6 N = 4

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
34	21	1.230288	1.630285	1.912581	2.211833
33	22	1.084045	1.375122	1.515299	1.395952
32	23	0.946425	1.148613	1.184563	0.807259
31	24	0.803629	0.919266	0.857429	0.250609
30	25	0.652872	0.683067	0.527207	-0.295551
29	26	0.517340	0.465336	0.216755	-0.822463
28	27	0.371936	0.239908	-0.094972	-1.330667
27	28	0.226370	0.008674	-0.423000	-1.900644
26	29	0.084110	-0.208359	-0.717069	-2.350973
25	30	-0.055414	-0.424024	-1.014242	-2.831356
24	31	-0.191749	-0.632152	-1.296203	-3.262808
23	32	-0.333810	-0.849657	-1.593629	-3.742022
22	33	-0.465879	-1.045149	-1.849945	-4.106979
21	34	-0.605924	-1.260465	-2.146701	-4.603147
20	35	-0.741443	-1.462788	-2.415775	-4.978811
19	36	-0.867184	-1.646488	-2.652768	-5.346788
18	37	-0.995330	-1.837144	-2.906929	-5.791724
17	38	-1.130781	-2.039691	-3.178093	-5.791724
16	39	-1.249124	-2.208286	-3.391474	-5.791724
15	40	-1.383094	-2.409046	-3.663540	-5.791724
14	41	-1.484767	-2.550028	-3.832682	-5.791724
13	42	-1.620875	-2.753501	-4.113509	-5.791724
12	43	-1.730347	-2.906928	-4.279840	-5.791724
11	44	-1.825300	-3.034328	-4.376750	-5.791724
10	45	-1.910624	-3.146301	-4.677780	-5.791724

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 5 N = 5

WY	WX	D=.2	D=.4	D=.6	D=.8
40	15	0.306911	0.586498	0.839810	1.067946
39	16	0.284369	0.538765	0.763916	0.960575
38	17	0.261517	0.491239	0.689775	0.857775
37	18	0.237238	0.441191	0.612398	0.751431
36	19	0.211320	0.388207	0.531131	0.640593
35	20	0.179972	0.325013	0.435416	0.511510
34	21	0.157813	0.279265	0.364635	0.414231
33	22	0.129381	0.221530	0.276662	0.295019
32	23	0.103222	0.168675	0.196562	0.187120
31	24	0.074812	0.111444	0.110027	0.070731
30	25	0.048737	0.058875	0.030521	-0.036184
29	26	0.020561	0.002054	-0.055443	-0.151821
28	27	-0.005095	-0.049201	-0.132231	-0.254062
27	28	-0.033968	-0.107016	-0.219129	-0.370258
26	29	-0.059679	-0.158498	-0.296448	-0.473493
25	30	-0.087405	-0.213508	-0.378303	-0.581743
24	31	-0.113095	-0.264538	-0.454364	-0.682574
23	32	-0.141168	-0.320428	-0.537899	-0.793677
22	33	-0.166800	-0.371183	-0.613283	-0.893202
21	34	-0.194422	-0.425672	-0.693932	-0.999360
20	35	-0.215159	-0.465723	-0.751874	-1.073759
19	36	-0.246205	-0.527713	-0.844925	-1.198200
18	37	-0.271044	-0.576365	-0.916456	-1.291747
17	38	-0.293904	-0.620761	-0.981074	-1.375363
16	39	-0.315055	-0.661438	-1.039896	-1.450928
15	40	-0.335229	-0.699660	-1.094270	-1.519785

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 5 N = 5

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
40	15	1.272070	1.685506	1.977319	2.286903
39	16	1.129531	1.436089	1.587881	1.482901
38	17	0.995911	1.215274	1.264212	0.902801
37	18	0.858891	0.993663	0.946065	0.355164
36	19	0.717124	0.768176	0.626930	-0.183073
35	20	0.553665	0.513373	0.271358	-0.774651
34	21	0.428394	0.311311	-0.018056	-1.279401
33	22	0.276871	0.073816	-0.349973	-1.831309
32	23	0.140618	-0.135670	-0.635619	-2.272118
31	24	-0.006243	-0.361837	-0.946426	-2.773336
30	25	-0.141058	-0.568675	-1.228642	-3.215383
29	26	-0.286942	-0.793056	-1.536592	-3.713000
28	27	-0.414530	-0.983286	-1.787595	-4.073555
27	28	-0.560321	-1.204989	-2.089464	-4.557207
26	29	-0.689562	-1.399740	-2.350497	-4.974263
25	30	-0.823734	-1.596362	-2.605408	-5.251812
24	31	-0.949131	-1.782773	-2.853330	-5.802720
23	32	-1.087835	-1.991298	-3.135133	-5.802720
22	33	-1.211032	-2.171645	-3.370479	-5.802720
21	34	-1.342096	-2.362510	-3.618344	-5.802720
20	35	-1.431494	-2.483227	-3.762457	-5.802720
19	36	-1.587961	-2.723539	-4.093450	-5.802720
18	37	-1.702626	-2.888201	-4.297571	-5.802720
17	38	-1.804111	-3.030397	-4.422508	-5.802720
16	39	-1.895313	-3.151447	-4.598605	-5.802720
15	40	-1.977428	-3.256182	-4.598605	-5.802720

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 7 N = 4

WY	WX	D=.2	D=.4	D=.6	D=.8
38	28	0.319101	0.610132	0.874142	1.112235
37	29	0.297317	0.563998	0.800781	1.008424
36	30	0.275112	0.517810	0.728718	0.908485
35	31	0.251165	0.468530	0.652644	0.804084
34	32	0.224576	0.414640	0.570625	0.692998
33	33	0.203279	0.370658	0.502533	0.599333
32	34	0.179182	0.321669	0.427819	0.498028
31	35	0.153089	0.268772	0.347313	0.389009
30	36	0.128624	0.219126	0.271726	0.286673
29	37	0.104062	0.169322	0.195960	0.184187
28	38	0.078871	0.118617	0.119382	0.081350
27	39	0.054401	0.069130	0.044307	-0.019910
26	40	0.030238	0.020755	-0.028326	-0.116840
25	41	0.004470	-0.031092	-0.106623	-0.222024
24	42	-0.020043	-0.080155	-0.180281	-0.320330
23	43	-0.044534	-0.129128	-0.253743	-0.418306
22	44	-0.070047	-0.179952	-0.329729	-0.519358
21	45	-0.094167	-0.228157	-0.401999	-0.615690
20	46	-0.118107	-0.275519	-0.472270	-0.708355
19	47	-0.143012	-0.325092	-0.546331	-0.806791
18	48	-0.166928	-0.372312	-0.616276	-0.898903
17	49	-0.190715	-0.419249	-0.685751	-0.990353
16	50	-0.216204	-0.469732	-0.760858	-1.089825
15	51	-0.239537	-0.515665	-0.828692	-1.178902
14	52	-0.259487	-0.554249	-0.884647	-1.250935
13	53	-0.285485	-0.605788	-0.961395	-1.352656
12	54	-0.308110	-0.649808	-1.025575	-1.435967
11	55	-0.328647	-0.689304	-1.082678	-1.509283
10	56	-0.348138	-0.726297	-1.135328	-1.575690

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
			M = 7 N = 4		
38	28	1.325576	1.758864	2.066129	2.394805
37	29	1.187725	1.517427	1.688645	1.612513
36	30	1.057793	1.302544	1.373380	1.046288
35	31	0.923465	1.085983	1.063369	0.515405
34	32	0.782265	0.864290	0.752771	0.000120
33	33	0.661528	0.669104	0.473293	-0.474150
32	34	0.532730	0.467405	0.192327	-0.934217
31	35	0.394197	0.250103	-0.112042	-1.442793
30	36	0.264257	0.046983	-0.395413	-1.920470
29	37	0.134248	-0.155647	-0.676737	-2.380684
28	38	0.004750	-0.353593	-0.945473	-2.793160
27	39	-0.123328	-0.551751	-1.218727	-3.237209
26	40	-0.244576	-0.733669	-1.460405	-3.587942
25	41	-0.377160	-0.937591	-1.741227	-4.050822
24	42	-0.500172	-1.122592	-1.988261	-4.414540
23	43	-0.622706	-1.306896	-2.235438	-4.801821
22	44	-0.748781	-1.495748	-2.488146	-5.241154
21	45	-0.869190	-1.676564	-2.730207	-5.481486
20	46	-0.983735	-1.843365	-2.945327	-5.760240
19	47	-1.106497	-2.027403	-3.192845	-5.760240
18	48	-1.220257	-2.193045	-3.407506	-5.760240
17	49	-1.333107	-2.357337	-3.619788	-5.760240
16	50	-1.456863	-2.542521	-3.867526	-5.760240
15	51	-1.566526	-2.700928	-4.083546	-5.760240
14	52	-1.653471	-2.820620	-4.226213	-5.760240
13	53	-1.780206	-3.009217	-4.481486	-5.760240
12	54	-1.881603	-3.149047	-4.782516	-5.760240
11	55	-1.969602	-3.277366	-4.782516	-5.760240
10	56	-2.048516	-3.367542	-4.782516	-5.760240

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 6 N = 5

WY	WX	D=.2	D=.4	D=.6	D=.8
45	21	0.337737	0.645672	0.924940	1.176729
44	22	0.317043	0.601759	0.854980	1.077553
43	23	0.296122	0.558141	0.786745	0.982667
42	24	0.274127	0.512655	0.716200	0.885411
41	25	0.250948	0.465091	0.642975	0.785181
40	26	0.224038	0.410513	0.559838	0.672465
39	27	0.201068	0.363585	0.487890	0.574359
38	28	0.176862	0.313988	0.411659	0.470184
37	29	0.152818	0.265213	0.337445	0.369811
36	30	0.127478	0.213877	0.259409	0.264318
35	31	0.102415	0.163389	0.183075	0.161670
34	32	0.078075	0.113972	0.107831	0.059825
33	33	0.053507	0.064708	0.033735	-0.039243
32	34	0.028123	0.013507	-0.043756	-0.143543
31	35	0.003083	-0.036654	-0.119154	-0.244325
30	36	-0.021440	-0.085741	-0.192842	-0.342640
29	37	-0.045927	-0.134686	-0.266227	-0.440466
28	38	-0.070921	-0.184665	-0.341230	-0.540580
27	39	-0.095906	-0.234263	-0.415091	-0.638364
26	40	-0.120361	-0.283086	-0.488218	-0.735772
25	41	-0.143971	-0.329575	-0.556848	-0.825787
24	42	-0.168739	-0.378896	-0.630598	-0.923942
23	43	-0.193473	-0.427805	-0.703166	-1.019702
22	44	-0.216850	-0.473913	-0.771382	-1.109424
21	45	-0.239920	-0.518957	-0.837350	-1.195258
20	46	-0.261980	-0.562251	-0.901108	-1.278888
19	47	-0.288278	-0.614372	-0.978758	-1.381888
18	48	-0.310311	-0.657355	-1.041700	-1.463785
17	49	-0.330907	-0.697218	-1.099577	-1.538437
16	50	-0.350156	-0.734167	-1.152658	-1.607004
15	51	-0.368606	-0.769038	-1.202458	-1.669777

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 6 N = 5

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
45	21	1.402299	1.860343	2.185199	2.533117
44	22	1.270355	1.628145	1.820426	1.770370
43	23	1.146665	1.422238	1.516412	1.218070
42	24	1.020969	1.217401	1.220215	0.701511
41	25	0.892317	1.011060	0.925948	0.198983
40	26	0.748877	0.785044	0.607858	-0.335085
39	27	0.623409	0.585417	0.324887	-0.818756
38	28	0.489905	0.371951	0.020542	-1.349034
37	29	0.362638	0.174215	-0.252090	-1.780793
36	30	0.228881	-0.034092	-0.541226	-2.254465
35	31	0.099408	-0.233051	-0.813276	-2.681307
34	32	-0.029839	-0.434581	-1.093205	-3.143349
33	33	-0.154011	-0.621937	-1.343766	-3.512199
32	34	-0.285697	-0.825081	-1.623917	-3.973630
31	35	-0.412036	-1.016246	-1.881467	-4.378110
30	36	-0.534989	-1.200614	-2.126262	-4.726565
29	37	-0.657281	-1.384400	-2.372604	-5.141538
28	38	-0.782645	-1.573907	-2.628641	-5.511450
27	39	-0.904022	-1.752825	-2.862753	-5.797756
26	40	-1.025728	-1.935685	-3.107986	-5.797756
25	41	-1.136342	-2.094049	-3.307919	-5.797756
24	42	-1.259005	-2.279456	-3.561033	-5.797756
23	43	-1.377511	-2.453118	-3.791290	-5.797756
22	44	-1.488145	-2.613822	-3.999566	-5.797756
21	45	-1.592868	-2.761326	-4.189230	-5.797756
20	46	-1.695729	-2.910943	-4.402304	-5.797756
19	47	-1.824009	-3.104909	-4.557206	-5.797756
18	48	-1.924299	-3.244277	-4.812479	-5.797756
17	49	-2.014174	-3.381115	-4.812479	-5.797756
16	50	-2.097312	-3.490260	-4.812479	-5.797756
15	51	-2.171005	-3.557206	-4.812479	-5.797756

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 7 N = 5		
50	28	0.364712	0.697488	0.999559	1.272178
49	29	0.345396	0.656449	0.934084	1.179219
48	30	0.325878	0.615692	0.870204	1.090211
47	31	0.305467	0.573403	0.804475	0.999401
46	32	0.284069	0.529387	0.736571	0.906262
45	33	0.259480	0.479464	0.660427	0.802889
44	34	0.240081	0.439421	0.598472	0.717719
43	35	0.215653	0.389806	0.522802	0.615024
42	36	0.194688	0.346886	0.456917	0.525137
41	37	0.171257	0.299312	0.384432	0.426919
40	38	0.148606	0.253462	0.314793	0.332864
39	39	0.125079	0.205814	0.242381	0.234991
38	40	0.103937	0.163037	0.177493	0.147531
37	41	0.079789	0.114297	0.103666	0.048074
36	42	0.057254	0.068951	0.035210	-0.043812
35	43	0.033871	0.021990	-0.035546	-0.138598
34	44	0.011707	-0.022571	-0.102746	-0.228692
33	45	-0.012061	-0.070201	-0.174367	-0.324464
32	46	-0.034037	-0.114151	-0.240281	-0.412329
31	47	-0.057744	-0.161537	-0.311358	-0.507140
30	48	-0.079679	-0.205182	-0.376484	-0.593519
29	49	-0.102891	-0.251464	-0.445723	-0.685637
28	50	-0.125176	-0.295816	-0.511961	-0.773617
27	51	-0.148922	-0.342947	-0.582152	-0.866577
26	52	-0.169561	-0.383704	-0.642496	-0.945949
25	53	-0.192549	-0.429199	-0.710068	-1.035236
24	54	-0.214699	-0.473047	-0.775223	-1.121381
23	55	-0.237465	-0.517968	-0.841750	-1.208983
22	56	-0.257457	-0.556996	-0.898848	-1.283200
21	57	-0.281246	-0.604028	-0.968728	-1.375691
20	58	-0.299431	-0.639199	-1.019723	-1.441360
19	59	-0.323397	-0.686667	-1.090379	-1.534953
18	60	-0.343654	-0.726163	-1.148001	-1.609916
17	61	-0.362701	-0.762926	-1.201189	-1.678037
16	62	-0.380528	-0.797206	-1.250620	-1.741430
15	63	-0.397717	-0.829657	-1.296445	-1.800236

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
			M = 7	N = 5	
50	28	1.516680	2.014281	2.368659	2.751291
49	29	1.392815	1.795377	2.023172	2.021597
48	30	1.276543	1.600766	1.734250	1.491190
47	31	1.158929	1.408097	1.454237	0.998341
46	32	1.039135	1.215011	1.177602	0.522318
45	33	0.907409	1.006776	0.883723	0.028032
44	34	0.797688	0.829577	0.629822	-0.409629
43	35	0.666892	0.623164	0.338833	-0.903061
42	36	0.551936	0.440622	0.081038	-1.341517
41	37	0.427107	0.245046	-0.192051	-1.793882
40	38	0.307980	0.060213	-0.446980	-2.199440
39	39	0.183896	-0.133035	-0.715359	-2.641380
38	40	0.073426	-0.302740	-0.946086	-2.992130
37	41	-0.052264	-0.497101	-1.214668	-3.434661
36	42	-0.167916	-0.673705	-1.454392	-3.805324
35	43	-0.286982	-0.854642	-1.698976	-4.184249
34	44	-0.400236	-1.027107	-1.932913	-4.552067
33	45	-0.520359	-1.209214	-2.179111	-4.946373
32	46	-0.630151	-1.373584	-2.397195	-5.314350
31	47	-0.748787	-1.552476	-2.638254	-5.782516
30	48	-0.856170	-1.711223	-2.846527	-5.764033
29	49	-0.971135	-1.883424	-3.076732	-5.764033
28	50	-1.080765	-2.047114	-3.296140	-5.764033
27	51	-1.196235	-2.218019	-3.521491	-5.764033
26	52	-1.294056	-2.359074	-3.697583	-5.764033
25	53	-1.404784	-2.522812	-3.914188	-5.764033
24	54	-1.511645	-2.680770	-4.122465	-5.764033
23	55	-1.619831	-2.838962	-4.331723	-5.764033
22	56	-1.710203	-2.964797	-4.516247	-5.764033
21	57	-1.825044	-3.137488	-4.800246	-5.764033
20	58	-1.904192	-3.247404	-4.946374	-5.764033
19	59	-2.020646	-3.420032	-4.800243	-5.764033
18	60	-2.111531	-3.537006	-4.800243	-5.764033
17	61	-2.195487	-3.703343	-4.800243	-5.764033
16	62	-2.268757	-3.800236	-4.800243	-5.764033
15	63	-2.337838	-3.800236	-4.800243	-5.764033

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

WY	WX	D=.2	D=.4	D=.6	D=.8
			M = 6 N = 6		
57	21	0.373179	0.713677	1.022706	1.301573
56	22	0.354269	0.673452	0.958493	1.210345
55	23	0.335241	0.633648	0.896023	1.123197
54	24	0.315442	0.592570	0.832087	1.034737
53	25	0.294916	0.550235	0.766596	0.944672
52	26	0.272269	0.503836	0.695257	0.847125
51	27	0.247577	0.453971	0.619591	0.744886
50	28	0.227364	0.412093	0.554553	0.655133
49	29	0.205050	0.366701	0.485285	0.561164
48	30	0.182522	0.320804	0.415133	0.465828
47	31	0.159383	0.273969	0.344008	0.369784
46	32	0.136363	0.227307	0.273016	0.273711
45	33	0.113824	0.181834	0.204207	0.181159
44	34	0.091140	0.135836	0.134231	0.086508
43	35	0.067927	0.089100	0.063646	-0.008276
42	36	0.045095	0.043200	-0.005570	-0.101063
41	37	0.022028	-0.003074	-0.075221	-0.194285
40	38	-0.000626	-0.048648	-0.143990	-0.286543
39	39	-0.023678	-0.094693	-0.212984	-0.378450
38	40	-0.046805	-0.141045	-0.282684	-0.471652
37	41	-0.069204	-0.185586	-0.349104	-0.559675
36	42	-0.092160	-0.231423	-0.417791	-0.651228
35	43	-0.114771	-0.276442	-0.485036	-0.740543
34	44	-0.137695	-0.322025	-0.553025	-0.830706
33	45	-0.159775	-0.365593	-0.617513	-0.915538
32	46	-0.181930	-0.409540	-0.682900	-1.002062
31	47	-0.204397	-0.454001	-0.748963	-1.089422
30	48	-0.227017	-0.498757	-0.815422	-1.177187
29	49	-0.248745	-0.541451	-0.878334	-1.259608
28	50	-0.270331	-0.583926	-0.941042	-1.341957
27	51	-0.289141	-0.620162	-0.993368	-1.409017
26	52	-0.313510	-0.668789	-1.066248	-1.506517
25	53	-0.335136	-0.711080	-1.128320	-1.587484
24	54	-0.354452	-0.748552	-1.182872	-1.658366
23	55	-0.372846	-0.784030	-1.234298	-1.724697
22	56	-0.390303	-0.817390	-1.282299	-1.786374
21	57	-0.407084	-0.849089	-1.327630	-1.841223

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 6 N = 6

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
57	21	1.551659	2.060572	2.423007	2.814516
56	22	1.430011	1.845176	2.082403	2.092500
55	23	1.316040	1.653908	1.797728	1.567502
54	24	1.201300	1.465267	1.522608	1.080090
53	25	1.085171	1.276998	1.251457	0.609139
52	26	0.960066	1.076537	0.965473	0.119358
51	27	0.830352	0.873402	0.680741	-0.360245
50	28	0.714261	0.683792	0.405198	-0.857326
49	29	0.594736	0.496530	0.144657	-1.278537
48	30	0.473241	0.305035	-0.124067	-1.727123
47	31	0.351618	0.116405	-0.384232	-2.142034
46	32	0.229649	-0.074278	-0.650187	-2.584753
45	33	0.112953	-0.252983	-0.892790	-2.954220
44	34	-0.007117	-0.440230	-1.153419	-3.390405
43	35	-0.126467	-0.622733	-1.401766	-3.781071
42	36	-0.243081	-0.799950	-1.640632	-4.139838
41	37	-0.360090	-0.977541	-1.880763	-4.519418
40	38	-0.476158	-1.154742	-2.121961	-4.871601
39	39	-0.590947	-1.326582	-2.350443	-5.195696
38	40	-0.707836	-1.503779	-2.590283	-5.774691
37	41	-0.817165	-1.664809	-2.799719	-5.774691
36	42	-0.931659	-1.837507	-3.033477	-5.774691
35	43	-1.042909	-2.003173	-3.253172	-5.774691
34	44	-1.155027	-2.169308	-3.472886	-5.774691
33	45	-1.259643	-2.320902	-3.666351	-5.774691
32	46	-1.366991	-2.479158	-3.876720	-5.774691
31	47	-1.475491	-2.640752	-4.083546	-5.774691
30	48	-1.584149	-2.800409	-4.297569	-5.774691
29	49	-1.685482	-2.945208	-4.511449	-5.774691
28	50	-1.786734	-3.091368	-4.671151	-5.774691
27	51	-1.867281	-3.200661	-4.774692	-5.774691
26	52	-1.989567	-3.388067	-4.879429	-5.774691
25	53	-2.088863	-3.529182	-4.879429	-5.774691
24	54	-2.174996	-3.666358	-4.879429	-5.774691
23	55	-2.256176	-3.733298	-4.879429	-5.774691
22	56	-2.326778	-4.034348	-4.879429	-5.774691
21	57	-2.390895	-4.034348	-4.879429	-5.774691

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 7 N = 6

WY	WX	D=.2	D=.4	D=.6	D=.8
63	28	0.404390	0.773582	1.108910	1.411751
62	29	0.386799	0.736142	1.049034	1.326545
61	30	0.369157	0.699134	0.990819	1.245144
60	31	0.350881	0.661130	0.931528	1.162911
59	32	0.332059	0.622203	0.871145	1.079638
58	33	0.311631	0.580208	0.806368	0.990789
57	34	0.289903	0.536051	0.738970	0.899231
56	35	0.269140	0.493492	0.673485	0.809592
55	36	0.249743	0.453673	0.612190	0.725733
54	37	0.228778	0.410884	0.546669	0.636517
53	38	0.207898	0.368417	0.481880	0.548639
52	39	0.186416	0.324761	0.415303	0.458336
51	40	0.165419	0.282344	0.351001	0.371660
50	41	0.144532	0.239836	0.286112	0.283598
49	42	0.123228	0.196815	0.220936	0.195801
48	43	0.102055	0.154035	0.156104	0.108464
47	44	0.080752	0.111124	0.091254	0.021320
46	45	0.059317	0.067934	0.025961	-0.066450
45	46	0.038192	0.025521	-0.037908	-0.151951
44	47	0.016908	-0.017319	-0.102593	-0.238785
43	48	-0.004272	-0.059683	-0.166147	-0.323536
42	49	-0.025617	-0.102446	-0.230427	-0.409453
41	50	-0.046912	-0.145006	-0.294244	-0.494547
40	51	-0.068092	-0.187375	-0.357822	-0.579362
39	52	-0.089114	-0.229164	-0.420127	-0.661928
38	53	-0.110087	-0.270974	-0.482654	-0.745065
37	54	-0.131230	-0.313000	-0.545333	-0.828209
36	55	-0.152252	-0.354789	-0.607661	-0.910882
35	56	-0.173004	-0.395881	-0.668692	-0.991445
34	57	-0.193928	-0.437381	-0.730461	-1.073212
33	58	-0.214096	-0.477014	-0.788853	-1.149669
32	59	-0.234720	-0.517941	-0.849841	-1.230566
31	60	-0.255562	-0.559049	-0.910668	-1.310639
30	61	-0.275770	-0.598818	-0.969400	-1.387766
29	62	-0.295933	-0.638379	-1.027664	-1.463997
28	63	-0.314332	-0.674192	-1.079933	-1.531761
27	64	-0.334166	-0.713037	-1.137097	-1.606575
26	65	-0.355313	-0.754885	-1.199303	-1.688899
25	66	-0.374696	-0.792639	-1.254409	-1.761168
24	67	-0.392337	-0.826808	-1.304096	-1.824315
23	68	-0.409170	-0.859147	-1.350509	-1.884669
22	69	-0.425274	-0.889880	-1.394452	-1.939445
21	70	-0.440826	-0.919182	-1.437140	-1.994668

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 7 N = 6

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
63	28	1.683585	2.237807	2.633937	3.065006
62	29	1.569776	2.035363	2.312202	2.375590
61	30	1.463066	1.855188	2.042387	1.872135
60	31	1.356141	1.678306	1.782853	1.407134
59	32	1.248478	1.502613	1.528240	0.960095
58	33	1.134181	1.318186	1.263516	0.502726
57	34	1.017440	1.133378	1.002217	0.058137
56	35	0.902319	0.948056	0.735997	-0.410688
55	36	0.794776	0.776135	0.491758	-0.828151
54	37	0.680848	0.595615	0.237037	-1.257908
53	38	0.569083	0.420482	-0.006847	-1.653918
52	39	0.454195	0.239973	-0.259728	-2.076967
51	40	0.344633	0.070940	-0.491224	-2.437457
50	41	0.232571	-0.105069	-0.737678	-2.852076
49	42	0.121666	-0.275999	-0.971979	-3.222433
48	43	0.011358	-0.445801	-1.204206	-3.585154
47	44	-0.098458	-0.614100	-1.433895	-3.947326
46	45	-0.209104	-0.783882	-1.666007	-4.312240
45	46	-0.316415	-0.946448	-1.884605	-4.630785
44	47	-0.425727	-1.113581	-2.112378	-5.020756
43	48	-0.531669	-1.272381	-2.323471	-5.261490
42	49	-0.639376	-1.435458	-2.543819	-5.738611
41	50	-0.745788	-1.595534	-2.758608	-5.738611
40	51	-0.851881	-1.755089	-2.972314	-5.738611
39	52	-0.954442	-1.906372	-3.169636	-5.738611
38	53	-1.058123	-2.061184	-3.375115	-5.738611
37	54	-1.161583	-2.215093	-3.581838	-5.738611
36	55	-1.264423	-2.368054	-3.785078	-5.738611
35	56	-1.364111	-2.513785	-3.971029	-5.738611
34	57	-1.465665	-2.663920	-4.180456	-5.738611
33	58	-1.559478	-2.797812	-4.349059	-5.738611
32	59	-1.660203	-2.948079	-4.555534	-5.738611
31	60	-1.759087	-3.092492	-4.779724	-5.738611
30	61	-1.854103	-3.231880	-4.844664	-5.738611
29	62	-1.947675	-3.362997	-5.044238	-5.738611
28	63	-2.030226	-3.480247	-5.044238	-5.738611
27	64	-2.122033	-3.602758	-5.044238	-5.738611
26	65	-2.224979	-3.765488	-5.044238	-5.738611
25	66	-2.312171	-3.862400	-5.044238	-5.738611
24	67	-2.391358	-3.941586	-5.044238	-5.738611
23	68	-2.464452	-4.066512	-5.044238	-5.738611
22	69	-2.535071	-4.066512	-5.044238	-5.738611
21	70	-2.589428	-4.066512	-5.044238	-5.738611

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 7 N = 7

WY	WX	D=.2	D=.4	D=.6	D=.8
77	28	0.439522	0.841012	1.205868	1.535597
76	29	0.423240	0.806259	1.150207	1.456255
75	30	0.406879	0.771934	1.096099	1.380416
74	31	0.390170	0.736994	1.041402	1.304322
73	32	0.372977	0.701354	0.985946	1.227617
72	33	0.354711	0.663624	0.927498	1.147106
71	34	0.335837	0.624926	0.867936	1.065580
70	35	0.313933	0.580526	0.800302	0.973812
69	36	0.297408	0.546227	0.746946	0.900093
68	37	0.277693	0.505953	0.685206	0.815914
67	38	0.258871	0.467479	0.626223	0.735533
66	39	0.238790	0.426579	0.563711	0.650561
65	40	0.219803	0.387994	0.504890	0.570846
64	41	0.199360	0.346509	0.441703	0.485232
63	42	0.180258	0.307721	0.382617	0.405214
62	43	0.160468	0.267595	0.321591	0.322710
61	44	0.140953	0.228098	0.261627	0.241770
60	45	0.120694	0.187175	0.199609	0.158197
59	46	0.101333	0.148121	0.140517	0.078715
58	47	0.080923	0.107000	0.078350	-0.004859
57	48	0.061723	0.068322	0.019923	-0.083301
56	49	0.041488	0.027661	-0.041373	-0.165466
55	50	0.021837	-0.011811	-0.100850	-0.245143
54	51	0.001655	-0.052298	-0.161783	-0.326681
53	52	-0.017721	-0.091068	-0.219966	-0.404289
52	53	-0.037935	-0.131512	-0.280669	-0.485300
51	54	-0.057296	-0.170224	-0.338732	-0.562722
50	55	-0.077373	-0.210293	-0.398723	-0.642592
49	56	-0.096864	-0.249119	-0.456744	-0.719661
48	57	-0.116930	-0.289110	-0.516533	-0.799161
47	58	-0.135846	-0.326654	-0.572407	-0.873052
46	59	-0.155987	-0.366698	-0.632163	-0.952366
45	60	-0.175031	-0.404483	-0.688413	-1.026829
44	61	-0.194914	-0.443905	-0.747048	-1.104370
43	62	-0.213989	-0.481631	-0.803022	-1.178224
42	63	-0.233241	-0.519614	-0.859219	-1.252122
41	64	-0.251782	-0.556162	-0.913292	-1.323276
40	65	-0.271696	-0.595543	-0.971745	-1.400490
39	66	-0.290104	-0.631793	-1.025347	-1.470913
38	67	-0.309503	-0.669946	-1.081643	-1.544915
37	68	-0.327527	-0.705252	-1.133495	-1.612492
36	69	-0.346452	-0.742395	-1.188105	-1.684135
35	70	-0.361742	-0.771720	-1.230270	-1.737994
34	71	-0.383233	-0.814495	-1.294187	-1.823697
33	72	-0.401221	-0.849550	-1.345757	-1.891244
32	73	-0.418355	-0.882851	-1.394052	-1.953915
31	74	-0.434380	-0.913804	-1.439134	-2.012142
30	75	-0.449759	-0.943351	-1.482218	-2.066550
29	76	-0.464490	-0.971729	-1.520007	-2.122067
28	77	-0.479063	-0.999107	-1.561400	-2.163460

TABLE C-2

TABLE OF LOG R(W|D), THE COMMON LOGARITHM OF THE RANK-SUM LIKELIHOOD RATIO UNDER NORMAL SHIFT ALTERNATIVE D

M = 7   N = 7

WY	WX	D=1.0	D=1.5	D=2.0	D=3.0
77	28	1.831787	2.436633	2.870312	3.345426
76	29	1.725615	2.246855	2.567095	2.688213
75	30	1.625963	2.077531	2.311876	2.205966
74	31	1.526729	1.912194	2.067588	1.762565
73	32	1.427248	1.748613	1.828793	1.337746
72	33	1.323263	1.579252	1.583662	0.908370
71	34	1.218594	1.411101	1.343095	0.492187
70	35	1.101651	1.225742	1.079804	0.035933
69	36	1.006229	1.069920	0.854083	-0.365134
68	37	0.898576	0.898623	0.611238	-0.778955
67	38	0.795877	0.735937	0.382354	-1.157840
66	39	0.687538	0.564818	0.141402	-1.564608
65	40	0.586255	0.406611	-0.077883	-1.914571
64	41	0.477426	0.235861	-0.317065	-2.317340
63	42	0.375823	0.077334	-0.536856	-2.672060
62	43	0.271244	-0.085138	-0.761231	-3.032905
61	44	0.168803	-0.243777	-0.979825	-3.385271
60	45	0.063188	-0.406820	-1.203998	-3.742818
59	46	-0.037043	-0.560473	-1.413130	-4.070001
58	47	-0.142420	-0.722288	-1.634581	-4.421900
57	48	-0.241133	-0.872702	-1.837888	-4.725716
56	49	-0.344419	-1.030059	-2.051424	-5.052725
55	50	-0.444509	-1.182228	-2.257494	-5.372938
54	51	-0.546824	-1.337367	-2.466814	-5.684561
53	52	-0.643862	-1.482878	-2.660124	-5.692339
52	53	-0.745244	-1.635587	-2.865617	-5.692339
51	54	-0.842051	-1.781091	-3.060279	-5.692339
50	55	-0.941775	-1.930536	-3.258995	-5.692339
49	56	-1.037753	-2.073063	-3.447959	-5.692339
48	57	-1.136898	-2.221245	-3.646535	-5.692339
47	58	-1.228479	-2.355450	-3.819840	-5.692339
46	59	-1.327276	-2.502937	-4.017295	-5.692339
45	60	-1.419689	-2.639769	-4.191451	-5.692339
44	61	-1.515893	-2.781405	-4.385271	-5.692339
43	62	-1.607260	-2.915422	-4.558875	-5.692339
42	63	-1.698337	-3.047257	-4.737453	-5.692339
41	64	-1.786092	-3.173887	-4.962762	-5.692339
40	65	-1.881875	-3.319497	-5.188729	-5.692339
39	66	-1.968778	-3.444251	-5.087703	-5.692339
38	67	-2.059923	-3.580960	-5.087703	-5.692339
37	68	-2.142236	-3.703337	-5.087703	-5.692339
36	69	-2.230188	-3.811240	-5.087703	-5.692339
35	70	-2.294188	-3.941571	-5.087703	-5.692339
34	71	-2.402038	-4.028720	-5.087703	-5.692339
33	72	-2.483470	-4.309545	-5.087703	-5.692339
32	73	-2.561370	-4.163430	-5.087703	-5.692339
31	74	-2.619342	-4.163430	-5.087703	-5.692339
30	75	-2.686338	-4.163430	-5.087703	-5.692339
29	76	-2.765520	-4.163430	-5.087703	-5.692339
28	77	-2.862430	-4.163430	-5.087703	-5.692339

TABLE D

TABLE D

$P(N_I;\ M,N,R,D)$

R	N_I	D=0	D=.2	D=.4	D=.6	D=.8
				M = 1, N = 1		
1	1	0.500000	0.556231	0.611351	0.664313	0.714196
				M = 2, N = 1		
1	1	0.333333	0.391392	0.451875	0.513387	0.574469
				M = 3, N = 1		
1	1	0.250000	0.304081	0.362696	0.424578	0.488231
2	1	0.500000	0.566015	0.630233	0.691003	0.746946
				M = 2, N = 2		
1	1	0.500000	0.568285	0.634566	0.697016	0.754136
2	2	0.166667	0.214500	0.269184	0.329757	0.394803
2	1	0.833333	0.873856	0.907090	0.933464	0.953710
				M = 4, N = 1		
1	1	0.200000	0.249631	0.305001	0.365088	0.428526
2	1	0.400000	0.467431	0.535778	0.603049	0.667347
				M = 3, N = 2		
1	1	0.400000	0.471007	0.542928	0.613417	0.680270
2	2	0.100000	0.137155	0.182463	0.235740	0.296192
2	1	0.700000	0.762841	0.817841	0.864214	0.901868
				M = 5, N = 1		
1	1	0.166667	0.212274	0.264317	0.322024	0.384213
2	1	0.333333	0.399060	0.467740	0.537347	0.605776
3	1	0.500000	0.569987	0.637836	0.701603	0.759702
				M = 4, N = 2		
1	1	0.333333	0.403300	0.476522	0.550516	0.622724
2	2	0.066667	0.095962	0.133481	0.179661	0.234328
2	1	0.600000	0.674127	0.742149	0.802121	0.852909
3	2	0.200000	0.260735	0.329408	0.403977	0.481784
3	1	0.800000	0.851554	0.893533	0.926306	0.950827

TABLE D

$P(N_I;\ M,N,R,D)$

R	N_I	D=1.0	D=1.5	D=2.0	D=3.0
		M = 1, N = 1			
1	1	0.760250	0.855578	0.921350	0.983053
		M = 2, N = 1			
1	1	0.633702	0.765812	0.865767	0.968795
		M = 3, N = 1			
1	1	0.552031	0.701863	0.822793	0.956374
2	1	0.797043	0.893710	0.951716	0.993638
		M = 2, N = 2			
1	1	0.804859	0.900933	0.956619	0.994725
2	2	0.462545	0.630691	0.774916	0.942866
2	1	0.968737	0.989754	0.997249	0.999894
		M = 4, N = 1			
1	1	0.493699	0.652865	0.787839	0.945311
2	1	0.727029	0.848857	0.927655	0.989564
		M = 3, N = 2			
1	1	0.741635	0.863588	0.938419	0.992235
2	2	0.362428	0.540137	0.707166	0.920514
2	1	0.931306	0.975624	0.993017	0.999706
		M = 5, N = 1			
1	1	0.449365	0.613555	0.758452	0.935305
2	1	0.671035	0.810105	0.905389	0.985338
3	1	0.811021	0.906984	0.961054	0.995902
		M = 4, N = 2			
1	1	0.690777	0.831427	0.921911	0.989829
2	2	0.296621	0.474302	0.653767	0.900794
2	1	0.894210	0.960069	0.987946	0.999453
3	2	0.559849	0.737644	0.867363	0.979674
3	1	0.968401	0.991180	0.998087	0.999959

TABLE D

$P(N_1 ; M,N,R,D)$

R	N_1	D=0	D=.2	D=.4	D=.6	D=.8
				M = 3, N = 3		
1	1	0.500000	0.575567	0.648402	0.716073	0.776691
2	2	0.200000	0.261888	0.331982	0.408106	0.487428
2	1	0.800000	0.852365	0.894806	0.927738	0.952195
3	3	0.050000	0.074789	0.107703	0.149556	0.200574
3	2	0.500000	0.583792	0.663911	0.737165	0.801214
3	1	0.950000	0.967863	0.980168	0.988265	0.993349
				M = 6, N = 1		
1	1	0.142857	0.184978	0.233936	0.289188	0.349745
2	1	0.285714	0.348752	0.416220	0.486201	0.556555
3	1	0.428571	0.499678	0.570780	0.639637	0.704220
				M = 5, N = 2		
1	1	0.285714	0.353299	0.425907	0.501126	0.576263
2	2	0.047619	0.071249	0.102726	0.142921	0.192163
2	1	0.523810	0.603305	0.678978	0.748073	0.808566
3	2	0.142857	0.194815	0.256501	0.326620	0.402987
3	1	0.714286	0.780360	0.836905	0.883193	0.919424
				M = 4, N = 3		
1	1	0.428571	0.506730	0.584621	0.659247	0.727993
2	2	0.142857	0.196440	0.260322	0.333053	0.412185
2	1	0.714286	0.782076	0.839743	0.886549	0.922785
3	3	0.028571	0.045723	0.070060	0.102964	0.145400
3	2	0.371429	0.458231	0.546962	0.633265	0.713157
3	1	0.885714	0.922655	0.949869	0.968927	0.981605
				M = 7, N = 1		
1	1	0.125000	0.164122	0.210302	0.263200	0.322010
2	1	0.250000	0.310117	0.375739	0.445115	0.516157
3	1	0.375000	0.445337	0.517422	0.588918	0.657549
4	1	0.500000	0.572131	0.641924	0.707262	0.766448
				M = 6, N = 2		
1	1	0.250000	0.314775	0.385896	0.461117	0.537749
2	2	0.035714	0.055182	0.081977	0.117259	0.161741
2	1	0.464286	0.545919	0.625967	0.701171	0.768836
3	2	0.107143	0.151584	0.206473	0.271232	0.344273
3	1	0.642857	0.718077	0.785001	0.841878	0.888025
4	2	0.214286	0.281278	0.356558	0.437396	0.520414
4	1	0.785714	0.842643	0.888808	0.924509	0.950823

TABLE D

$P(N_I;\ M,N,R,D)$

R	N_I	D=1.0	D=1.5	D=2.0	D=3.0
		M = 3, N = 3			
1	1	0.829060	0.922385	0.970450	0.997472
2	2	0.566785	0.745993	0.874358	0.981760
2	1	0.969572	0.991735	0.998262	0.999965
3	3	0.260249	0.437210	0.623570	0.889891
3	2	0.854772	0.943403	0.982526	0.999188
3	1	0.996393	0.999360	0.999916	0.999999
		M = 6, N = 1			
1	1	0.414216	0.580994	0.733157	0.926149
2	1	0.625108	0.776361	0.884925	0.981083
3	1	0.762888	0.877593	0.946317	0.993848
		M = 5, N = 2			
1	1	0.648638	0.803241	0.906789	0.987499
2	2	0.250091	0.423869	0.610114	0.883110
2	1	0.859331	0.944175	0.982396	0.999147
3	2	0.482738	0.676035	0.828382	0.971528
3	1	0.946527	0.983911	0.996273	0.999912
		M = 4, N = 3			
1	1	0.788903	0.901353	0.961664	0.996652
2	2	0.494525	0.691577	0.842404	0.976182
2	1	0.949532	0.985483	0.996809	0.999933
3	3	0.197668	0.365664	0.559449	0.863100
3	2	0.783565	0.909242	0.970221	0.998494
3	1	0.989612	0.997988	0.999715	0.999998
		M = 7, N = 1			
1	1	0.385481	0.553379	0.710998	0.917697
2	1	0.586627	0.746679	0.866109	0.976861
3	1	0.721311	0.850566	0.931963	0.991636
4	1	0.818323	0.913628	0.965455	0.996798
		M = 6, N = 2			
1	1	0.612942	0.778198	0.892831	0.985239
2	2	0.215490	0.383789	0.573483	0.867059
2	1	0.827120	0.928455	0.976578	0.998798
3	2	0.423097	0.624267	0.793271	0.963367
3	1	0.923755	0.975615	0.994031	0.999846
4	2	0.602020	0.779570	0.898603	0.987851
4	1	0.969300	0.992206	0.998514	0.999978

TABLE D

$P(N_I; M, N, R, D)$

R	N_I	D=0	D=.2	D=.4	D=.6	D=.8
				M = 5, N = 3		
1	1	0.375000	0.453271	0.533452	0.612267	0.686609
2	2	0.107143	0.153355	0.210818	0.278845	0.355572
2	1	0.642857	0.720568	0.789299	0.847168	0.893529
3	3	0.017857	0.030196	0.048680	0.074959	0.110459
3	2	0.285714	0.368781	0.458338	0.549884	0.638640
3	1	0.821429	0.874338	0.915408	0.945621	0.966670
4	3	0.071429	0.107833	0.155583	0.214987	0.285161
4	2	0.500000	0.592405	0.679897	0.758337	0.824934
4	1	0.928571	0.954866	0.972843	0.984465	0.991563
				M = 4, N = 4		
1	1	0.500000	0.580775	0.658198	0.729341	0.792035
2	2	0.214286	0.284596	0.363891	0.448965	0.535868
2	1	0.785714	0.844979	0.892437	0.928523	0.954569
3	3	0.071429	0.108284	0.156753	0.217142	0.288503
3	2	0.500000	0.593365	0.681659	0.760627	0.827433
3	1	0.928571	0.955093	0.973138	0.984736	0.991772
4	4	0.014286	0.024869	0.041163	0.064905	0.097699
4	3	0.242857	0.323096	0.412264	0.505904	0.598882
4	2	0.757143	0.825340	0.880062	0.921501	0.951106
4	1	0.985714	0.992212	0.995978	0.998035	0.999093
				M = 8, N = 1		
1	1	0.111111	0.147643	0.191343	0.242045	0.299112
2	1	0.222222	0.279475	0.343018	0.411287	0.482298
3	1	0.333333	0.402043	0.473903	0.546599	0.617735
4	1	0.444444	0.517495	0.589953	0.659450	0.723904
				M = 7, N = 2		
1	1	0.222222	0.284133	0.353377	0.427924	0.505163
2	2	0.027778	0.044111	0.067228	0.098476	0.138857
2	1	0.416667	0.498628	0.581008	0.660278	0.733264
3	2	0.083333	0.121607	0.170470	0.229952	0.299050
3	1	0.583333	0.664148	0.738364	0.803405	0.857766
4	2	0.166667	0.226527	0.296480	0.374431	0.457332
4	1	0.722222	0.789983	0.847184	0.893176	0.928372

TABLE D

P(N_1; M,N,R,D)

R	N_1	D=1.0	D=1.5	D=2.0	D=3.0
		M = 5, N = 3			
1	1	0.753915	0.882063	0.953308	0.995843
2	2	0.438086	0.645595	0.813753	0.970812
2	1	0.928856	0.978509	0.995088	0.999891
3	3	0.156094	0.313006	0.508295	0.839260
3	2	0.720283	0.875506	0.957011	0.997660
3	1	0.980547	0.995944	0.999390	0.999995
4	3	0.363966	0.576299	0.764067	0.958462
4	2	0.878488	0.959844	0.990037	0.999745
4	1	0.995655	0.999350	0.999932	1.000000
		M = 4, N = 4			
1	1	0.845046	0.935222	0.977716	0.998508
2	2	0.620472	0.799745	0.913506	0.991084
2	1	0.972408	0.993533	0.998874	0.999986
3	3	0.368579	0.583410	0.771303	0.961279
3	2	0.880904	0.961334	0.990613	0.999772
3	1	0.995797	0.999385	0.999937	1.000000
4	4	0.140698	0.293083	0.488831	0.830374
4	3	0.686226	0.857150	0.949829	0.997217
4	2	0.971056	0.993794	0.999050	0.999992
4	1	0.999606	0.999962	0.999998	1.000000
		M = 8, N = 1			
1	1	0.361434	0.529532	0.691318	0.909839
2	1	0.553812	0.720313	0.848759	0.972708
3	1	0.685074	0.825777	0.918160	0.989322
4	1	0.781707	0.891883	0.954969	0.995492
		M = 7, N = 2			
1	1	0.582176	0.755705	0.879866	0.983044
2	2	0.188786	0.351054	0.542131	0.852351
2	1	0.797538	0.913156	0.970627	0.998413
3	2	0.375717	0.580201	0.761592	0.955309
3	1	0.901074	0.966702	0.991457	0.999761
4	2	0.541549	0.734431	0.872470	0.983510
4	1	0.953996	0.987499	0.997463	0.999958

TABLE D

$P(N_1; M,N,R,D)$

R	N_1	D=0	D=.2	D=.4	D=.6	D=.8
				M = 6, N = 3		
1	1	0.333333	0.410476	0.491362	0.572630	0.650864
2	2	0.083333	0.123373	0.174963	0.238093	0.311518
2	1	0.583333	0.667247	0.743901	0.810452	0.865335
3	3	0.011905	0.021086	0.035484	0.056842	0.086853
3	2	0.226190	0.303263	0.390098	0.482609	0.575838
3	1	0.761905	0.827208	0.880093	0.920599	0.949916
4	3	0.047619	0.075744	0.114660	0.165543	0.228491
4	2	0.404762	0.499816	0.594818	0.684436	0.764244
4	1	0.880952	0.921468	0.950723	0.970644	0.983423
				M = 5, N = 4		
1	1	0.444444	0.527572	0.609491	0.686700	0.756319
2	2	0.166667	0.230367	0.305336	0.388968	0.477480
2	1	0.722222	0.793585	0.853027	0.899907	0.934899
3	3	0.047619	0.076343	0.116301	0.168723	0.233663
3	2	0.404762	0.501514	0.598114	0.688950	0.769417
3	1	0.880952	0.922070	0.951552	0.971448	0.984074
4	4	0.007937	0.014813	0.026139	0.043704	0.069392
4	3	0.166667	0.236047	0.318562	0.410819	0.507862
4	2	0.642857	0.731142	0.806977	0.868142	0.914457
4	1	0.960317	0.977109	0.987529	0.993595	0.996904
				M = 9, N = 1		
1	1	0.100000	0.134279	0.175765	0.224440	0.279822
2	1	0.200000	0.254552	0.315970	0.382882	0.453430
3	1	0.300000	0.366708	0.437686	0.510704	0.583335
4	1	0.400000	0.472713	0.546338	0.618388	0.686536
5	1	0.500000	0.573472	0.644472	0.710777	0.770614
				M = 7, N = 3		
1	1	0.300000	0.375394	0.456050	0.538640	0.619580
2	2	0.066667	0.101610	0.148032	0.206492	0.276329
2	1	0.533333	0.620964	0.703237	0.776567	0.838568
3	3	0.008333	0.015361	0.026826	0.044469	0.070121
3	2	0.183333	0.253955	0.336549	0.427700	0.522656
3	1	0.708333	0.782955	0.845562	0.895167	0.932253
4	3	0.033333	0.055433	0.087431	0.131078	0.187247
4	2	0.333333	0.426534	0.523970	0.619880	0.708791
4	1	0.833333	0.886211	0.926136	0.954508	0.973468
5	3	0.083333	0.126523	0.182734	0.251706	0.331602
5	2	0.500000	0.597525	0.689282	0.770510	0.838181
5	1	0.916667	0.947910	0.969164	0.982745	0.990889

TABLE D

$P(N_I;\ M, N, R, D)$

R	N_I	D=1.0	D=1.5	D=2.0	D=3.0
		M = 6, N = 3			
1	1	0.723036	0.864256	0.945337	0.995043
2	2	0.392754	0.606081	0.787821	0.965632
2	1	0.908306	0.971098	0.993161	0.999841
3	3	0.126858	0.272644	0.466314	0.817773
3	2	0.664746	0.843168	0.943413	0.996713
3	1	0.969954	0.993331	0.998943	0.999991
4	3	0.302273	0.514816	0.718200	0.946694
4	2	0.831356	0.940184	0.984206	0.999555
4	1	0.991140	0.998557	0.999837	0.999999
		M = 5, N = 4			
1	1	0.816405	0.921503	0.972591	0.998141
2	2	0.566443	0.763745	0.895458	0.988947
2	1	0.959611	0.990098	0.998219	0.999977
3	3	0.309729	0.527445	0.732047	0.952677
3	2	0.836588	0.943743	0.985697	0.999632
3	1	0.991604	0.998686	0.999858	0.999999
4	4	0.104882	0.241526	0.433710	0.801454
4	3	0.603978	0.807270	0.928324	0.995689
4	2	0.947378	0.987719	0.997987	0.999982
4	1	0.998593	0.999852	0.999990	1.000000
		M = 9, N = 1			
1	1	0.340936	0.508638	0.673645	0.902488
2	1	0.525417	0.696685	0.832700	0.968639
3	1	0.653193	0.803010	0.904965	0.986946
4	1	0.748834	0.871310	0.944550	0.994074
5	1	0.822799	0.917598	0.967992	0.997264
		M = 7, N = 3			
1	1	0.695497	0.847726	0.937714	0.994253
2	2	0.355535	0.571662	0.764168	0.960625
2	1	0.888272	0.963438	0.991072	0.999784
3	3	0.105411	0.240750	0.431112	0.798214
3	2	0.616070	0.812592	0.929735	0.995672
3	1	0.958392	0.990249	0.998381	0.999985
4	3	0.255540	0.464006	0.677520	0.935128
4	2	0.786437	0.919607	0.977608	0.999314
4	1	0.985370	0.997440	0.999693	0.999999
5	3	0.419105	0.641843	0.819901	0.975609
5	2	0.891247	0.967619	0.993004	0.999877
5	1	0.995467	0.999396	0.999946	1.000000

TABLE D

P(N$_I$; M,N,R,D)

R	N_I	D=0	D=.2	D=.4	D=.6	D=.8
				M = 6, N = 4		
1	1	0.400000	0.483736	0.568244	0.649670	0.724588
2	2	0.133333	0.190695	0.260717	0.341509	0.429693
2	1	0.666667	0.746755	0.815726	0.871849	0.914976
3	3	0.033333	0.056052	0.089208	0.134676	0.193343
3	2	0.333333	0.428725	0.528427	0.626262	0.716413
3	1	0.833333	0.887247	0.927629	0.956023	0.974746
4	4	0.004762	0.009430	0.017576	0.030897	0.051356
4	3	0.119048	0.177801	0.251768	0.338956	0.435262
4	2	0.547619	0.647092	0.737486	0.814327	0.875425
4	1	0.928571	0.956893	0.975475	0.986873	0.993401
5	4	0.023810	0.041726	0.068958	0.107739	0.159568
5	3	0.261905	0.352540	0.452149	0.554544	0.653063
5	2	0.738095	0.815191	0.876468	0.921957	0.953488
5	1	0.976190	0.987217	0.993556	0.996956	0.998655
				M = 5, N = 5		
1	1	0.500000	0.584818	0.665739	0.739418	0.803472
2	2	0.222222	0.298592	0.384496	0.475827	0.567706
2	1	0.777778	0.841888	0.892672	0.930609	0.957328
3	3	0.083333	0.128029	0.186595	0.258681	0.342142
3	2	0.500000	0.600374	0.694450	0.777100	0.845184
3	1	0.916667	0.948668	0.970138	0.983624	0.991548
4	4	0.023810	0.041886	0.069438	0.108751	0.161344
4	3	0.261905	0.353224	0.453609	0.556725	0.655768
4	2	0.738095	0.815679	0.877208	0.922742	0.954178
4	1	0.976190	0.987275	0.993619	0.997003	0.998684
5	5	0.003968	0.008045	0.015315	0.027442	0.046403
5	4	0.103175	0.157929	0.228530	0.313548	0.409259
5	3	0.500000	0.604336	0.701631	0.786242	0.854875
5	2	0.896825	0.936446	0.963171	0.979962	0.989781
5	1	0.996032	0.998166	0.999208	0.999681	0.999880
				M = 10, N = 1		
1	1	0.090909	0.123214	0.162716	0.209529	0.263305
2	1	0.181818	0.233864	0.293203	0.358645	0.428469
3	1	0.272727	0.337301	0.407038	0.479831	0.553275
4	1	0.363636	0.435325	0.509197	0.582740	0.653475
5	1	0.454545	0.528795	0.602049	0.671861	0.736126

TABLE D

$P(N_I; M,N,R,D)$

R	N_I	D=1.0	D=1.5	D=2.0	D=3.0
		M = 6, N = 4			
1	1	0.790434	0.908547	0.967618	0.997776
2	2	0.520842	0.731386	0.878495	0.986844
2	1	0.946259	0.986284	0.997456	0.999967
3	3	0.264666	0.480776	0.697146	0.944420
3	2	0.794450	0.925543	0.980274	0.999465
3	1	0.986317	0.997726	0.999743	0.999999
4	4	0.080922	0.203266	0.389369	0.775557
4	3	0.535043	0.760793	0.906552	0.993961
4	2	0.920865	0.980145	0.996544	0.999966
4	1	0.996890	0.999645	0.999974	1.000000
5	4	0.224682	0.432824	0.655416	0.930938
5	3	0.741846	0.900223	0.971868	0.999145
5	2	0.973891	0.995293	0.999429	0.999997
5	1	0.999445	0.999955	0.999998	1.000000
		M = 5, N = 5			
1	1	0.856685	0.943871	0.982150	0.999006
2	2	0.655283	0.832031	0.934353	0.994681
2	1	0.975067	0.994820	0.999226	0.999994
3	3	0.433183	0.661316	0.837115	0.980345
3	2	0.897789	0.971207	0.994188	0.999913
3	1	0.995900	0.999491	0.999958	1.000000
4	4	0.227426	0.438198	0.662002	0.934231
4	3	0.744786	0.902548	0.972962	0.999210
4	2	0.974420	0.995464	0.999460	0.999998
4	1	0.999461	0.999957	0.999998	1.000000
5	5	0.074246	0.192358	0.376637	0.768260
5	4	0.510105	0.743751	0.898566	0.993341
5	3	0.906815	0.976102	0.995776	0.999958
5	2	0.995123	0.999430	0.999957	1.000000
5	1	0.999958	0.999998	1.000000	1.000000
		M = 10, N = 1			
1	1	0.323201	0.490114	0.657631	0.895580
2	1	0.500546	0.675346	0.817779	0.964666
3	1	0.624900	0.782043	0.892384	0.984535
4	1	0.719210	0.851932	0.934319	0.992573
5	1	0.793272	0.900378	0.959897	0.996327

TABLE D

$P(N_I; M, N, R, D)$

R	N_I	D=0	D=.2	D=.4	D=.6	D=.8
				M = 7, N = 4		
1	1	0.363636	0.446949	0.532797	0.617139	0.696143
2	2	0.109091	0.160729	0.225806	0.303145	0.389892
2	1	0.618182	0.704456	0.780921	0.844858	0.895257
3	3	0.024242	0.042490	0.070257	0.109838	0.162765
3	2	0.278788	0.370490	0.470186	0.571693	0.668501
3	1	0.787879	0.852503	0.902739	0.939328	0.964272
4	4	0.003030	0.006318	0.012349	0.022679	0.039239
4	3	0.087879	0.137419	0.202911	0.283707	0.376812
4	2	0.469697	0.574314	0.674030	0.762683	0.836194
4	1	0.893939	0.933572	0.960816	0.978282	0.988713
5	4	0.015152	0.028104	0.048937	0.080202	0.124059
5	3	0.196970	0.278754	0.373910	0.477078	0.581389
5	2	0.651515	0.744129	0.822095	0.883187	0.927734
5	1	0.954545	0.974384	0.986469	0.993316	0.996918
				M = 6, N = 5		
1	1	0.454545	0.541491	0.626445	0.705496	0.775575
2	2	0.181818	0.252715	0.335437	0.426368	0.520638
2	1	0.727273	0.801449	0.862210	0.909032	0.942959
3	3	0.060606	0.097666	0.148638	0.214222	0.293277
3	2	0.424242	0.527978	0.629792	0.723121	0.803044
3	1	0.878788	0.922767	0.953595	0.973764	0.986067
4	4	0.015152	0.028309	0.049587	0.081646	0.126721
4	3	0.196970	0.279846	0.376381	0.480973	0.586468
4	2	0.651515	0.745167	0.823766	0.885060	0.929464
4	1	0.954545	0.974569	0.986681	0.993485	0.997029
5	5	0.002165	0.004711	0.009573	0.018209	0.032515
5	4	0.067100	0.109770	0.168693	0.244278	0.334459
5	3	0.391775	0.499980	0.608067	0.708229	0.794368
5	2	0.824675	0.886191	0.930650	0.960424	0.978891
5	1	0.987013	0.993628	0.997088	0.998763	0.999512
				M = 11, N = 1		
1	1	0.083333	0.113895	0.151613	0.196713	0.248973
2	1	0.166667	0.216406	0.273750	0.337686	0.406629
3	1	0.250000	0.312429	0.380739	0.452961	0.526747
4	1	0.333333	0.403626	0.477169	0.551484	0.624015
5	1	0.416667	0.490800	0.565247	0.637437	0.705031
6	1	0.500000	0.574388	0.646212	0.713170	0.773440

TABLE D

P(N$_1$; M,N,R,D)

R	N$_1$	D=1.0	D=1.5	D=2.0	D=3.0
		M = 7, N = 4			
1	1	0.766725	0.896273	0.962787	0.997413
2	2	0.481814	0.702085	0.862497	0.984772
2	1	0.932692	0.982187	0.996603	0.999954
3	3	0.229255	0.441239	0.665839	0.936478
3	2	0.755010	0.907191	0.974481	0.999273
3	1	0.980174	0.996525	0.999590	0.999998
4	4	0.064130	0.173920	0.352870	0.752125
4	3	0.477130	0.717993	0.884989	0.992071
4	2	0.893048	0.971422	0.994755	0.999944
4	1	0.994509	0.999328	0.999947	1.000000
5	4	0.181676	0.379343	0.608364	0.916147
5	3	0.679826	0.867793	0.960461	0.998684
5	2	0.957954	0.991775	0.998930	0.999995
5	1	0.998676	0.999883	0.999994	1.000000
		M = 6, N = 5			
1	1	0.834808	0.934108	0.978805	0.998809
2	2	0.612938	0.806303	0.922870	0.993644
2	1	0.966070	0.992686	0.998879	0.999990
3	3	0.382699	0.619010	0.811932	0.976644
3	2	0.867012	0.960674	0.991767	0.999871
3	1	0.993061	0.999089	0.999922	1.000000
4	4	0.185978	0.388619	0.620623	0.922938
4	3	0.685607	0.872846	0.963034	0.998855
4	2	0.959345	0.992273	0.999029	0.999996
4	1	0.998739	0.999893	0.999994	1.000000
5	5	0.054658	0.156928	0.331556	0.738712
5	4	0.434668	0.686091	0.868898	0.990698
5	3	0.863145	0.961953	0.992817	0.999921
5	2	0.989494	0.998655	0.999891	1.000000
5	1	0.999822	0.999990	1.000000	1.000000
		M = 11, N = 1			
1	1	0.307668	0.473532	0.643007	0.889059
2	1	0.478536	0.655940	0.803863	0.960790
3	1	0.599592	0.762670	0.880400	0.982107
4	1	0.692388	0.833704	0.924342	0.991008
5	1	0.766147	0.883831	0.951780	0.995311
6	1	0.825821	0.920234	0.969638	0.997547

TABLE D

P(N$_1$; M,N,R,D)

R	N$_1$	D=0	D=.2	D=.4	D=.6	D=.8
				M = 7, N = 5		
1	1	0.416667	0.504447	0.592041	0.675143	0.750122
2	2	0.151515	0.216960	0.295825	0.385123	0.480226
2	1	0.681818	0.763758	0.832874	0.887613	0.928294
3	3	0.045455	0.076384	0.120777	0.180179	0.254392
3	2	0.363636	0.467245	0.573107	0.673836	0.763110
3	1	0.840909	0.895676	0.935548	0.962577	0.979621
4	4	0.010101	0.019895	0.036577	0.062943	0.101681
4	3	0.151515	0.225356	0.315804	0.418480	0.526587
4	2	0.575758	0.679809	0.771502	0.846333	0.902877
4	1	0.929293	0.958888	0.977658	0.988679	0.994662
5	5	0.001263	0.002924	0.006292	0.012613	0.023629
5	4	0.045455	0.078795	0.127649	0.193859	0.276962
5	3	0.310606	0.416072	0.527821	0.637207	0.736170
5	2	0.752525	0.832310	0.893451	0.936695	0.964913
5	1	0.973485	0.986329	0.993449	0.997089	0.998803
6	5	0.007576	0.015432	0.029259	0.051787	0.085833
6	4	0.121212	0.187209	0.271303	0.370325	0.478201
6	3	0.500000	0.611857	0.715061	0.802925	0.871964
6	2	0.878788	0.926601	0.958549	0.978221	0.989375
6	1	0.992424	0.996548	0.998543	0.999432	0.999796
				M = 6, N = 6		
1	1	0.500000	0.588113	0.671844	0.747483	0.812483
2	2	0.227273	0.308384	0.399452	0.495560	0.591036
2	1	0.772727	0.840555	0.893765	0.932901	0.959881
3	3	0.090909	0.141377	0.207408	0.287982	0.379843
3	2	0.500000	0.605918	0.704436	0.789687	0.858346
3	1	0.909091	0.945011	0.968788	0.983410	0.991756
4	4	0.030303	0.053955	0.089869	0.140462	0.206711
4	3	0.272727	0.372098	0.480504	0.589988	0.692440
4	2	0.727273	0.811546	0.877631	0.925534	0.957622
4	1	0.969697	0.984123	0.992258	0.996494	0.998529
5	5	0.007576	0.015486	0.029446	0.052238	0.086726
5	4	0.121212	0.187595	0.272257	0.371958	0.480495
5	3	0.500000	0.612408	0.716035	0.804112	0.873148
5	2	0.878788	0.926798	0.958798	0.978437	0.989528
5	1	0.992424	0.996562	0.998556	0.999440	0.999800
6	6	0.001082	0.002556	0.005598	0.011404	0.021673
6	5	0.040043	0.070858	0.116911	0.180438	0.261440
6	4	0.283550	0.387552	0.500099	0.612346	0.715587
6	3	0.716450	0.804976	0.874354	0.924399	0.957618
6	2	0.959957	0.978960	0.989747	0.995377	0.998075
6	1	0.998918	0.999576	0.999847	0.999949	0.999984

TABLE D

P(N_1; M,N,R,D)

R	N_1	D=1.0	D=1.5	D=2.0	D=3.0
		M = 7, N = 5			
1	1	0.814501	0.924736	0.975525	0.998613
2	2	0.575620	0.782420	0.911833	0.992614
2	1	0.956655	0.990334	0.998481	0.999987
3	3	0.341105	0.581582	0.788492	0.973010
3	2	0.836843	0.949599	0.989089	0.999823
3	1	0.989609	0.998565	0.999872	1.000000
4	4	0.154689	0.347678	0.584071	0.912124
4	3	0.632262	0.843579	0.952570	0.998448
4	2	0.942434	0.988361	0.998464	0.999993
4	1	0.997663	0.999787	0.999988	1.000000
5	5	0.041490	0.130481	0.295070	0.712126
5	4	0.373709	0.634269	0.839934	0.987820
5	3	0.818968	0.946013	0.989192	0.999871
5	2	0.981893	0.997489	0.999783	1.000000
5	1	0.999546	0.999972	0.999999	1.000000
6	5	0.133668	0.315612	0.550471	0.898229
6	4	0.587064	0.815646	0.941306	0.997893
6	3	0.922047	0.983206	0.997651	0.999988
6	2	0.995195	0.999530	0.999972	1.000000
6	1	0.999932	0.999997	1.000000	1.000000
		M = 6, N = 6			
1	1	0.865677	0.950140	0.985119	0.999283
2	2	0.680466	0.853946	0.947231	0.996438
2	1	0.977316	0.995744	0.999440	0.999997
3	3	0.477881	0.711017	0.874148	0.988054
3	2	0.909841	0.977397	0.996071	0.999960
3	1	0.996176	0.999588	0.999972	1.000000
4	4	0.287516	0.527002	0.749716	0.965233
4	3	0.781354	0.927227	0.983160	0.999694
4	2	0.977484	0.996596	0.999671	0.999999
4	1	0.999429	0.999962	0.999998	1.000000
5	5	0.135209	0.319428	0.556077	0.901790
5	4	0.589859	0.818464	0.942907	0.998015
5	3	0.923066	0.983628	0.997745	0.999989
5	2	0.995289	0.999546	0.999974	1.000000
5	1	0.999934	0.999997	1.000000	1.000000
6	6	0.038548	0.124428	0.286652	0.706096
6	5	0.357072	0.619905	0.831893	0.987039
6	4	0.803223	0.940278	0.987890	0.999854
6	3	0.977905	0.996873	0.999726	1.000000
6	2	0.999261	0.999953	0.999998	1.000000
6	1	0.999996	1.000000	1.000000	1.000000

TABLE D

$P(N_1;\ M,N,R,D)$

R	N_1	D=0	D=.2	D=.4	D=.6	D=.8
				M = 12, N = 1		
1	1	0.076923	0.105934	0.142039	0.185564	0.236395
2	1	0.153846	0.201466	0.256920	0.319356	0.387328
3	1	0.230769	0.291107	0.357902	0.429335	0.503135
4	1	0.307692	0.376395	0.449247	0.523839	0.597584
5	1	0.384615	0.458086	0.533013	0.606776	0.676876
6	1	0.461538	0.536600	0.610375	0.680362	0.744448
				M = 7, N = 6		
1	1	0.461538	0.551587	0.638973	0.719434	0.789767
2	2	0.192308	0.268747	0.357378	0.453687	0.551899
2	1	0.730769	0.807269	0.869070	0.915776	0.948782
3	3	0.069930	0.113385	0.172720	0.247995	0.336880
3	2	0.437063	0.546204	0.651895	0.746801	0.825856
3	1	0.877622	0.923771	0.955500	0.975712	0.987631
4	4	0.020979	0.039384	0.068835	0.112363	0.171903
4	3	0.216783	0.309329	0.415533	0.527904	0.637619
4	2	0.657343	0.755202	0.835788	0.896901	0.939571
4	1	0.951049	0.973331	0.986505	0.993672	0.997257
5	5	0.004662	0.010150	0.020448	0.038234	0.066569
5	4	0.086247	0.141384	0.216075	0.309055	0.415554
5	3	0.412587	0.529023	0.642930	0.745198	0.829491
5	2	0.820513	0.886671	0.933422	0.963711	0.981691
5	1	0.983683	0.992216	0.996573	0.998611	0.999483
6	6	0.000583	0.001479	0.003460	0.007489	0.015041
6	5	0.025058	0.047500	0.083436	0.136260	0.207665
6	4	0.208625	0.303122	0.412711	0.529216	0.642849
6	3	0.616550	0.723589	0.813507	0.882664	0.931358
6	2	0.922494	0.956894	0.977829	0.989481	0.995406
6	1	0.995921	0.998300	0.999349	0.999771	0.999927

TABLE D

$P(N_I;\ M,N,R,D)$

R	N_I	D=1.0	D=1.5	D=2.0	D=3.0
		M = 12, N = 1			
1	1	0.293921	0.458563	0.629568	0.882881
2	1	0.458885	0.638187	0.790839	0.957012
3	1	0.576794	0.744707	0.868983	0.979677
4	1	0.667988	0.816557	0.914652	0.989397
5	1	0.741189	0.868000	0.943721	0.994230
6	1	0.801089	0.905993	0.963062	0.996823
		M = 7, N = 6			
1	1	0.848191	0.942779	0.982767	0.999165
2	2	0.646047	0.834524	0.939317	0.995854
2	1	0.970590	0.994307	0.999235	0.999995
3	3	0.434765	0.678212	0.856866	0.986133
3	2	0.886977	0.970472	0.994713	0.999944
3	1	0.994131	0.999337	0.999953	1.000000
4	4	0.247444	0.484952	0.720118	0.959886
4	3	0.736573	0.907851	0.977839	0.999580
4	2	0.966999	0.994708	0.999466	0.999999
4	1	0.998902	0.999922	0.999997	1.000000
5	5	0.108312	0.279041	0.516047	0.888243
5	4	0.527950	0.779307	0.927301	0.997316
5	3	0.893305	0.975668	0.996461	0.999981
5	2	0.991465	0.999112	0.999945	1.000000
5	1	0.999823	0.999992	1.000000	1.000000
6	6	0.028126	0.100769	0.250874	0.676902
6	5	0.296589	0.561751	0.796251	0.983072
6	4	0.744632	0.916359	0.981924	0.999762
6	3	0.962748	0.994241	0.999458	0.999999
6	2	0.998157	0.999871	0.999995	1.000000
6	1	0.999978	0.999999	1.000000	1.000000

TABLE D

P(N₁; M,N,R,D)

R	N_1	D=0	D=.2	D=.4	D=.6	D=.8
				M = 7, N = 7		
1	1	0.500000	0.590889	0.676956	0.754168	0.819852
2	2	0.230769	0.315776	0.411079	0.511028	0.609251
2	1	0.769231	0.840063	0.895148	0.935106	0.962137
3	3	0.096154	0.151175	0.223125	0.310335	0.408518
3	2	0.500000	0.610504	0.712605	0.799795	0.868648
3	1	0.903846	0.942775	0.968220	0.983569	0.992105
4	4	0.034965	0.062998	0.105513	0.164876	0.241363
4	3	0.279720	0.385454	0.500118	0.614317	0.718876
4	2	0.720280	0.809749	0.879179	0.928573	0.960784
4	1	0.965035	0.982019	0.991456	0.996257	0.998492
5	5	0.010490	0.021672	0.041326	0.072978	0.119808
5	4	0.132867	0.207828	0.302754	0.412687	0.529277
5	3	0.500000	0.618835	0.727313	0.817721	0.886537
5	2	0.867133	0.921205	0.956799	0.978162	0.989845
5	1	0.989510	0.995329	0.998092	0.999287	0.999756
6	6	0.002331	0.005541	0.012097	0.024336	0.045274
6	5	0.051282	0.091550	0.151067	0.231331	0.330262
6	4	0.296037	0.409274	0.530420	0.648500	0.753429
6	3	0.703963	0.800335	0.874981	0.927585	0.961306
6	2	0.948718	0.973541	0.987463	0.994558	0.997841
6	1	0.997669	0.999102	0.999684	0.999899	0.999971
7	7	0.000291	0.000802	0.002021	0.004681	0.010002
7	6	0.014569	0.029880	0.056384	0.098232	0.158627
7	5	0.143065	0.223508	0.324430	0.439753	0.559914
7	4	0.500000	0.621261	0.731543	0.822770	0.891427
7	3	0.856935	0.915277	0.953746	0.976788	0.989318
7	2	0.985431	0.993485	0.997336	0.999006	0.999662
7	1	0.999709	0.999903	0.999971	0.999992	0.999998

TABLE D

$P(N_I;\ M, N, R, D)$

R	N_I	D=1.0	D=1.5	D=2.0	D=3.0
		M = 7, N = 7			
1	1	0.872908	0.954917	0.987238	0.999454
2	2	0.699892	0.869948	0.955938	0.997428
2	1	0.979194	0.996425	0.999578	0.999998
3	3	0.511436	0.745965	0.897766	0.991919
3	2	0.918971	0.981601	0.997178	0.999979
3	1	0.996480	0.999665	0.999980	1.000000
4	4	0.332538	0.587873	0.802332	0.978419
4	3	0.806994	0.942652	0.988551	0.999857
4	2	0.980039	0.997369	0.999787	1.000000
4	1	0.999442	0.999968	0.999999	1.000000
5	5	0.183624	0.407760	0.658458	0.945986
5	4	0.642679	0.861450	0.963558	0.999210
5	3	0.934399	0.988055	0.998662	0.999996
5	2	0.995664	0.999647	0.999984	1.000000
5	1	0.999924	0.999997	1.000000	1.000000
6	6	0.078187	0.227553	0.459083	0.865146
6	5	0.441904	0.717699	0.900108	0.995896
6	4	0.838512	0.959152	0.993527	0.999960
6	3	0.980969	0.997775	0.999849	1.000000
6	2	0.999219	0.999959	0.999999	1.000000
6	1	0.999992	1.000000	1.000000	1.000000
7	7	0.019782	0.079638	0.216173	0.645528
7	6	0.238462	0.499372	0.754708	0.977942
7	5	0.674222	0.884264	0.973221	0.999613
7	4	0.938454	0.989528	0.998936	0.999998
7	3	0.995501	0.999652	0.999985	1.000000
7	2	0.999896	0.999996	1.000000	1.000000
7	1	1.000000	1.000000	1.000000	1.000000

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13. Abstract

Let Z denote a random vector of m+n zeros and ones where the i-th component of Z is 0(1) if the i-th order statistic of the independent random variables $(X_1,\ldots,X_m, Y_1,\ldots,Y_n)$ is an X(Y) and the X's(Y's) are normally distributed with mean 0(D) and variance 1. Values of $P_{m,n}(z|D)$, the probability of the rank order z, are tabulated to 9 decimal places for all z for $1 < n < m < 7$ and n=1, m=8(1)12; D=0(.2)1,1.5,2,3.

These tables are used to find the exact power of the Wilcoxon, c_1, median, and Kolmogorov-Smirnov two-sample tests for location against the normal shift alternative for sample sizes $1 < n < m < 7$ and for one-sided and two-sided tests at nominal levels of significance = .25,.10,.05,.025,.01,.005. Selected power and efficiency comparisons are made among these tests and with the two-sample Student's t-test. The most powerful rank test is also considered.

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13. Abstract(cont.)

Sequential two-sample rank tests based on the likelihood ratios of the probabilities of the vector z and of the rank sum $\Sigma_1^{m+n} iz_i$ are described, extending the work of Wilcoxon et al (Biometrics, 1963) to the case of the normal shift hypothesis. Tables are presented which facilitate the use of these tests, and values of the OC and ASN functions are given.

A multiple decision or ranking procedure is considered for selecting a subset of s populations from among k normal populations with common variance σ^2 such that at least c of the t populations with largest means are among the s populations selected. The populations corresponding to the s largest sample means are selected. The probability of a correct selection in the so-called least favorable configuration is tabulated for various s, c, t and k.

14. Key Words

Mathematical statistics
Two sample problem
Probability tables
Rank order
Normal distribution
Power
Sequential rank test
Rank sum
Average sample number
Multiple decision procedure
Ranking procedure
Most powerful rank test
Wilcoxon test
c_1 test
Median test
Kolmogorov-Smirnov test

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